

CONTENTS

VACUOLAR IMPORT OF PROTEINS AND ORGANELLES FROM THE CYTOPLASM, <i>Daniel J. Klionsky and Yoshinori Ohsumi</i>	1
BLUE-LIGHT PHOTORECEPTORS IN HIGHER PLANTS, <i>Winslow R. Briggs and Eva Huala</i>	33
COOPERATION BETWEEN MICROTUBULE- AND ACTIN-BASED MOTOR PROTEINS, <i>Susan S. Brown</i>	63
MOLECULAR MECHANISMS OF NEURAL CREST FORMATION, <i>Carole LaBonne and Marianne Bronner-Fraser</i>	81
LYMPHOCYTE SURVIVAL—THE STRUGGLE AGAINST DEATH, <i>Robert H. Arch and Craig B. Thompson</i>	113
THE ROAD LESS TRAVELED: EMERGING PRINCIPLES OF KINESIN MOTOR UTILIZATION, <i>Lawrence S. B. Goldstein and Alastair Valentine Philp</i>	141
PROTEINS OF THE ADF/COFLIN FAMILY: ESSENTIAL REGULATORS OF ACTIN DYNAMICS, <i>James R. Bamburg</i>	185
VISUAL TRANSDUCTION IN DROSOPHILA, <i>Craig Montell</i>	231
BIOCHEMICAL PATHWAYS OF CASPASES ACTIVATION DURING APOPTOSIS, <i>Imawati Budihardjo, Holt Oliver, Michael Lutter, Xu Luo, and Xiaodong Wang</i>	269
REGULATION OF NUCLEAR LOCALIZATION: A KEY TO A DOOR, <i>Arie Kaffman and Erin K. O'Shea</i>	291
ACTIN-RELATED PROTEINS, <i>D. A. Schafer and T. A. Schroer</i>	341
CELL POLARITY IN YEAST, <i>John Chant</i>	365
VERTEBRATE ENDODERM DEVELOPMENT, <i>James M. Wells and Douglas A. Melton</i>	393
NEURAL INDUCTION, <i>Daniel C. Weinstein and Ali Hemmati-Brivanlou</i>	411
SCF AND CULLIN/RING H2-BASED UBIQUITIN LIGASES, <i>R. J. Deshaies</i>	435
INTEGRATION OF SIGNALING NETWORKS THAT REGULATE DICTYOSTELIUM DIFFERENTIATION, <i>Laurence Aubry and Richard Firtel</i>	469
WHEN TO SWITCH TO FLOWERING, <i>Gordon G. Simpson, Anthony R. Gendall, and Caroline Dean</i>	519
REGULATION OF MAMMALIAN O ₂ HOMEOSTASIS BY HYPOXIA-INDUCIBLE FACTOR 1, <i>Gregg L. Semenza</i>	551

CONTENTS

VACUOLAR IMPORT OF PROTEINS AND ORGANELLES FROM THE CYTOPLASM, <i>Daniel J. Klionsky and Yoshinori Ohsumi</i>	1
BLUE-LIGHT PHOTORECEPTORS IN HIGHER PLANTS, <i>Winslow R. Briggs and Eva Huala</i>	33
COOPERATION BETWEEN MICROTUBULE- AND ACTIN-BASED MOTOR PROTEINS, <i>Susan S. Brown</i>	63
MOLECULAR MECHANISMS OF NEURAL CREST FORMATION, <i>Carole LaBonne and Marianne Bronner-Fraser</i>	81
LYMPHOCYTE SURVIVAL—THE STRUGGLE AGAINST DEATH, <i>Robert H. Arch and Craig B. Thompson</i>	113
THE ROAD LESS TRAVELED: EMERGING PRINCIPLES OF KINESIN MOTOR UTILIZATION, <i>Lawrence S. B. Goldstein and Alastair Valentine Philp</i>	141
PROTEINS OF THE ADF/COFLIN FAMILY: ESSENTIAL REGULATORS OF ACTIN DYNAMICS, <i>James R. Bamburg</i>	185
VISUAL TRANSDUCTION IN DROSOPHILA, <i>Craig Montell</i>	231
BIOCHEMICAL PATHWAYS OF CASPASES ACTIVATION DURING APOPTOSIS, <i>Imawati Budihardjo, Holt Oliver, Michael Lutter, Xu Luo, and Xiaodong Wang</i>	269
REGULATION OF NUCLEAR LOCALIZATION: A KEY TO A DOOR, <i>Arie Kaffman and Erin K. O'Shea</i>	291
ACTIN-RELATED PROTEINS, <i>D. A. Schafer and T. A. Schroer</i>	341
CELL POLARITY IN YEAST, <i>John Chant</i>	365
VERTEBRATE ENDODERM DEVELOPMENT, <i>James M. Wells and Douglas A. Melton</i>	393
NEURAL INDUCTION, <i>Daniel C. Weinstein and Ali Hemmati-Brivanlou</i>	411
SCF AND CULLIN/RING H2-BASED UBIQUITIN LIGASES, <i>R. J. Deshaies</i>	435
INTEGRATION OF SIGNALING NETWORKS THAT REGULATE DICTYOSTELIUM DIFFERENTIATION, <i>Laurence Aubry and Richard Firtel</i>	469
WHEN TO SWITCH TO FLOWERING, <i>Gordon G. Simpson, Anthony R. Gendall, and Caroline Dean</i>	519
REGULATION OF MAMMALIAN O ₂ HOMEOSTASIS BY HYPOXIA-INDUCIBLE FACTOR 1, <i>Gregg L. Semenza</i>	551

MECHANISMS OF VIRAL INTERFERENCE WITH MHC CLASS I ANTIGEN PROCESSING AND PRESENTATION, <i>Jonathan W. Yewdell and Jack R. Bennink</i>	579
TRANSPORT BETWEEN THE CELL NUCLEUS AND THE CYTOPLASM, <i>Dirk Görlich and Ulrike Kutay</i>	607
[<i>PSI+</i>]: AN EPIGENETIC MODULATOR OF TRANSLATION TERMINATION EFFICIENCY, <i>Tricia R. Serio and Susan L. Lindquist</i>	661
ADAPTORS FOR CLATHRIN-MEDIATED TRAFFIC, <i>Tomas Kirchhausen</i>	705
SYNAPTIC VESICLE BIOGENESIS, <i>Matthew J. Hannah, Anne A. Schmidt, and Wieland B. Huttner</i>	733
THE TRANSLOCON: A DYNAMIC GATEWAY AT THE ER MEMBRANE, <i>Arthur E. Johnson and Michael A. van Waes</i>	799
INDEXES	
Subject Index	843
Cumulative Index of Contributing Authors, Volumes 11-15	883
Cumulative Index of Chapter Titles, Volumes 11-15	885

SUBJECT INDEX

A

A20 gene
lymphocyte cell death and,
127

Acanthamoeba spp.
actin-microtubule
cooperation and, 64

actin-related proteins and,
351, 354–55

ADF/cofilin family
proteins and, 187–88,
191, 195, 204, 213

Accessory proteins
ADF/cofilin family
proteins and, 201–2

ACT genes
actin-related proteins and,
349, 357

Actin
ADF/cofilin family
proteins and, 185–219

cell polarity in yeast and,
365–67, 382–83

kinesin motor utilization
and, 142

synaptic vesicle biogenesis
and, 779–80

visual transduction in
Drosophila spp. and,
256

Actin-based proteins
microtubule-based proteins
and, 63–76

Actin-binding proteins
synaptic vesicle biogenesis
and, 779–80

Actin-depolymerizing factor
(ADF)/cofilin family
proteins
actin-binding domains,
192–93

AIP1 accessory protein,
201–2

animal cells, 203–4

biochemistry, 189–97

Caenorhabditis elegans,
210

compartmentalization, 199

competitive binding, 200

dephosphorylation, 203–7

Dictyostelium discoideum,
211, 213–14

distribution, 207–16

Drosophila melanogaster,
211

embryos, 214–15

evolution, 218–19

filament, 193

future research, 219

gene structure, 218

Hirano bodies, 216–17

history, 187–88

inhibition of activity,
209–13

intracellular function,
207–16

intracellular localization,
208–9

introduction, 186–87

ischemic kidney disease,
217–18

isoforms, 197–98

Lim kinases, 205–6

Listeria monocytogenes,
212

mammalian cells, 212–13

mechanism of action,
193–97

mRNA expression, 198–99

muscle cells in culture, 214

neurodegenerative disease,
216–17

nomenclature, 188,
189

nuclear localization
sequence, 190–91

overexpression, 213–16

pathologies, 216–18

pH regulation, 200–1

phosphatases, 206–7

phosphatidylinositide
binding and hydrolysis,
202–3

phosphorylation, 203–7

phylogenetic relationships
of proteins containing
ADF-H domain, 218–19

plant cells, 203–4, 215–16

pointed ends, 199–200

posttranslational
modification, 189

primary sequence, 189–90

protein expression,
198–99

regulatory mechanisms,
197–207

secondary structure,
191–92

signaling pathways, 204–7

structural relationship to
other actin-binding
proteins, 192

structure, 189–93

supramolecular forms of
ADF/cofilin-actin, 197

Swiss 3T3 cells, 215

tertiary structure, 191–92

tissue distribution and
amounts, 207–8

tropomyosins, 200

Williams syndrome, 217

Xenopus laevis, 211–12,
214–15

Actin-related proteins (ARPs)

- actin-nucleating activity, 352–54
- Arp1, 344
- Arp2/3 complex, 347, 351–56
- Arp11, 344, 346–48
- biochemistry, 348, 351–52
- cell biology, 348–49, 355–56
- dynactin, 344–48
- future research, 357–58
- genetics, 349–50, 356
- introduction, 342
- nucleus, 356–57
- phylogeny, 343–45
- profilin-binding activity, 354–55

Action spectra

- blue-light photoreceptors in higher plants and, 51–52

Activation

- blue-light photoreceptors in higher plants and, 33
- caspase and, 269–84
- HIF-1 and O₂ homeostasis, 568–69
- lymphocyte cell death and, 113–15
- signaling network for *Dicyostelium* spp. and, 469
- switching to flowering and, 539–40
- visual transduction in *Drosophila* spp. and, 231, 237, 246–48

Activin

- neural induction and, 412–13

Actophilin

- ADF/cofilin family proteins and, 187

Actophorin

- ADF/cofilin family

Adaptation

- HIF-1 and O₂ homeostasis, 551
- visual transduction in *Drosophila* spp. and, 251–52

Adaptors

- clathrin-mediated traffic and adaptor complexes, 708–22
- AP180, 720–21
- β-arrestins, 706–8, 718–19
- CALM, 720–21
- clathrin partners, 720–22
- coat formation, 722–23
- domain organization, 710
- ear domain of α chain, 710–11
- future research, 723–24
- introduction, 706
- LL motif, 716–18
- monomeric adaptors, 706–8
- μ-chains, 712–13
- μ2-chain, 715–16
- multimeric adaptors, 708–18
- NPXY motif, 711–12
- regulatory inputs, 718–20
- sorting signals, 711–18
- specificity of interaction, 713–14
- Yppø motif, 712–16

lymphocyte cell death and, 120–22

nuclear transport and, 607, 612

synaptic vesicle biogenesis and, 770–75

***ade2-1* gene**

[PSI⁺] factor and, 664–65

proteins and, 188–89, 194–95, 204

Adenosine deaminase deficiency

- caspase activation during apoptosis and, 282

Adenosine diphosphate (ADP)

- actin-related proteins and, 348
- kinesin motor utilization and, 154
- lymphocyte cell death and, 125
- translocons and endoplasmic reticulum membrane, 810

Adenosine triphosphate (ATP)

- actin-microtubule cooperation and, 65
- actin-related proteins and, 342, 348, 357–58
- ADF/cofilin family proteins and, 191, 199, 216–17
- caspase activation during apoptosis and, 276, 278, 282–83
- HIF-1 and O₂ homeostasis, 569
- kinesin motor utilization and, 145, 150, 161–62
- lymphocyte cell death and, 125
- translocons and endoplasmic reticulum membrane, 810, 816, 825

Adenyllyl cyclases

- signaling network for *Dicyostelium* spp. and, 469, 495–96

Adiantum capillus-veneris

- blue-light photoreceptors in higher plants and, 42–43, 48–49

***AG* gene**

- switching to flowering and, 524, 529, 532, 538

Aggregation
signaling network for
Dictyostelium spp. and,
469–505

A kinase-anchoring proteins
(AKAPs)
regulation of nuclear
localization and, 316, 322

AIP1 accessory protein
ADF/cofilin family
proteins and, 201–2

ala3 gene
ADF/cofilin family
proteins and, 202

ALDA gene
HIF-1 and O₂ homeostasis,
564

Alimentary tract
vertebrate endoderm
development and,
393–405

Allosuppressors
[PSI⁺] factor and, 663

Amino acids
actin-related proteins and,
342–43, 350
ADF/cofilin family
proteins and, 185,
189–90, 192–93, 202,
205–6
blue-light photoreceptors
in higher plants and, 36,
41, 48–49
caspase activation during
apoptosis and, 283
cell polarity in yeast and,
379, 381
kinesin motor utilization
and, 145–46
lymphocyte cell death and,
123
[PSI⁺] factor and, 666
regulation of nuclear
localization and, 304,
307, 309–12, 321

SCF and
Ring-H2/Cullin-based

ubiquitin ligases, 443–44,
446, 448, 451, 454–56
switching to flowering and,
530

translocons and
endoplasmic reticulum
membrane, 809, 815, 821

vacuolar import of proteins
and organelles from
cytoplasm, 6

visual transduction in
Drosophila spp. and,
240–41, 254

Aminopeptidase I
vacuolar import of proteins
and organelles from
cytoplasm, 1, 4–7, 17, 28

Amoebae
signaling network for
Dictyostelium spp. and,
469–505

Amphibia
neural induction and,
411–27

Amphipathic helices
caspase activation during
apoptosis and, 280

Amphiphysin
synaptic vesicle biogenesis
and, 778–79

Amyloid proteins
[PSI⁺] factor and, 661

Anaphase B
kinesin motor utilization
and, 158–59, 164

Ancillary regulation
neural induction and,
424–25

Anemia
HIF-1 and O₂ homeostasis,
567

Animal caps
neural crest formation and,
85

Animal cells
ADF/cofilin family
proteins and, 185, 203–4

blue-light photoreceptors
in higher plants and,
43–44

Ankyrin repeats
visual transduction in
Drosophila spp. and,
240–41

Anteroposterior (A-P) axis
signaling network for
Dictyostelium spp. and,
469–505

vertebrate endoderm
development and, 396–97

Antibodies
actin-related proteins and,
349, 355
ADF/cofilin family
proteins and, 210

kinesin motor utilization
and, 148–49, 152, 154,
158–59, 162, 169–70

visual transduction in
Drosophila spp. and,
255

Antigen presenting cells
(APCs)
lymphocyte cell death and,
114

Antigen processing
viral interference and MHC
class I, 579–601

Antirrhinum spp.
switching to flowering and,
524, 539

Antisense inhibition
kinesin motor utilization
and, 155–56, 160

Apaf-1 protein
caspase activation during
apoptosis and, 269,
277–79, 282

AP complexes
clathrin-mediated traffic
and, 705–24

AP genes
switching to flowering and,
524, 529, 537–41, 543

A

Apg pathway
HIF-1 and O₂ homeostasis, 568
vacuolar import of proteins and organelles from cytoplasm, 4–8, 10, 13–17, 18, 28

ApoB protein
translocons and endoplasmic reticulum membrane, 831

Apoptosis
caspase activation and, 269–84
lymphocyte survival and, 113–28

Apoptososome
caspase activation during apoptosis and, 282

Aqueous pore
translocons and endoplasmic reticulum membrane, 799–832

Arabidopsis spp.
ADF/cofilin family
proteins and, 188
blue-light photoreceptors in higher plants and, 33, 36, 38, 40–42, 45–46, 48–50
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 441, 442, 449
switching to flowering and, 519–44

β -Arrestins
adaptors for clathrin-mediated traffic and, 705–8, 718–19

Arrestin
visual transduction in *Drosophila* spp. and, 243, 245

arr genes
visual transduction in

Drosophila spp. and, 232, 237, 243–44, 254

Asparagine
translocons and endoplasmic reticulum membrane, 821

Aspartate
lymphocyte cell death and, 123

Aspergillus nidulans
kinesin motor utilization and, 164

SCF and
Ring-H2/Cullin-based ubiquitin ligases, 441

Astrocytes
kinesin motor utilization and, 154–55

AUT genes
vacuolar import of proteins and organelles from cytoplasm, 13–17, 28

Autoantibodies
lymphocyte cell death and, 128

Autoimmunity
viral interference and MHC class I, 579–601

Autonomous promotion pathway
switching to flowering and, 529–42

Autophagy
vacuolar import of proteins and organelles from cytoplasm, 1–28

Avena sativa
blue-light photoreceptors in higher plants and, 45

AXL genes
cell polarity in yeast and, 368–70, 374–75

Axonal transport
actin-microtubule cooperation and, 70–71, 76

ADF/cofilin family
proteins and, 217

cell polarity in yeast and, 365

kinesin motor utilization and, 143, 148, 150, 154, 156, 168, 170

Azotobacter vinelandii
blue-light photoreceptors in higher plants and, 47

B

Bacillus firmus
blue-light photoreceptors in higher plants and, 52

Bacteria
blue-light photoreceptors in higher plants and, 47–48, 52

kinesin motor utilization and, 152, 159

lymphocyte cell death and, 113

Bad protein
caspase activation during apoptosis and, 281

Barbed ends
ADF/cofilin family
proteins and, 194, 197

Barley
switching to flowering and, 544

Barrels
visual transduction in *Drosophila* spp. and, 240–41

Basal bodies
kinesin motor utilization and, 170

Bax-mediated cell death
caspase activation during apoptosis and, 279, 281

B cells
lymphocyte cell death and, 114, 117–18, 126–28

Bcl-2 protein family
caspase activation during

apoptosis and, 269–70, 276, 279–81
lymphocyte cell death and, 116, 124–26

BH3-containing protein model
caspase activation during apoptosis and, 279, 281–83

bHLH gene
vertebrate endoderm development and, 402

Bid protein
caspase activation during apoptosis and, 269, 279–81

Bidirectional motor kinesin motor utilization and, 153

Biological systems regulation of nuclear localization and, 292, 298, 328

BiP protein translocons and endoplasmic reticulum membrane, 799, 802, 804, 808, 812–14, 816, 821–25, 831

BIR repeats caspase activation during apoptosis and, 283

Bladder cancer neural crest formation and, 94

Blastomeres ADF/cofilin family proteins and, 214

Blebbing ADF/cofilin family proteins and, 218

Blue-light photoreceptors higher plants and action spectra, 51–52 *Adiantum* PHY3, 48–49 animals, 43–44

Arabidopsis NPL1, 48–49 circadian rhythms, 43–44 co-action between photoreceptor systems, 50–51 cryptochromes, 35–44, 51 downstream events, 48 future research, 52–53 introduction, 34–35 LOV domains, 46–47 miscellaneous photosynthetic organisms, 42–43 nomenclature, 51 phototropin, 44–49 phototropism pathway, 50–51 NPH1, 44–49 signal transduction, 48 stomatal opening, 49–50

BMP genes neural crest formation and, 81, 83–93, 97, 99–101, 103–4 neural induction and, 411, 423–24 vertebrate endoderm development and, 401

Bone morphogenetic proteins (BMPs) neural induction and, 393, 395, 411, 413–27 vertebrate endoderm development and, 401

Bradyrhizobium japonicum blue-light photoreceptors in higher plants and, 48

Brain ADF/cofilin family proteins and, 191, 208 visual transduction in *Drosophila* spp. and, 234–35

Brassica spp.

switching to flowering and, 544

Brefeldin A kinesin motor utilization and, 154–55

Budding adaptors for clathrin-mediated traffic and, 705–24

cell polarity in yeast and, 368–74

SCF and Ring-H2/Cullin-based ubiquitin ligases, 436, 449, 457

synaptic vesicle biogenesis and, 733–84

vertebrate endoderm development and, 393, 403–5

BUD genes cell polarity in yeast and, 368–73, 376, 384

C

Ca^{2+}

lymphocyte cell death and, 122, 125

visual transduction in *Drosophila* spp. and, 231, 238–39, 246–48, 250–54, 257, 259

Cadherins neural crest formation and, 99–101

regulation of nuclear localization and, 323–26

Caenorhabditis elegans actin-related proteins and, 343

ADF/cofilin family proteins and, 195, 198, 210

caspase activation during apoptosis and, 271, 273, 278, 282

kinesin motor utilization

and, 151, 154, 159
lymphocyte cell death and, 116, 123–24, 126
SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 441, 453

Calcineurin
 regulation of nuclear localization and, 302–5

CAL gene
 switching to flowering and, 537–38, 543

Calmodulin
 visual transduction in *Drosophila* spp. and, 232, 238–41, 249, 251–54

CALM protein
 adaptors for clathrin-mediated traffic and, 720–21

Cancer
 caspase activation during apoptosis and, 283
 HIF-1 and O₂ homeostasis, 566–70
 neural crest formation and, 94
 neural induction and, 420–21
 vertebrate endoderm development and, 394, 401

Candida bodinii
 vacuolar import of proteins and organelles from cytoplasm, 23–24

Carboxypeptidases
 vacuolar import of proteins and organelles from cytoplasm, 2

Cargo attachment strategies
 kinesin motor utilization and, 141, 147, 150–56, 167–70

Cargo-receptor complexes
 nuclear transport and, 607, 611–12, 618–19

regulation of nuclear localization and, 299–322

Cargo proteins
 adaptors for clathrin-mediated traffic and, 705–24

cAR receptors
 signaling network for *Dictyostelium* spp. and, 471–75, 486–89

Cardiovascular development
 HIF-1 and O₂ homeostasis, 551–71

Cascades
 lymphocyte cell death and, 113, 119
 signaling network for *Dictyostelium* spp. and, 470
 visual transduction in *Drosophila* spp. and, 231–59

Caspases
 activation during apoptosis and
 Bcl-2, 279–81
 BH3-containing protein model, 281–83
 IAPs, 283, 284
 introduction, 270
 ion channel, 280–81
 mitochondria, 276–84
 overview, 270–73
 permeability transition pore, 279–80
 perspectives, 284
 regulation, 279–84
 surface death receptors, 271, 274–76

lymphocyte cell death and, 116, 123–24

Catastrophe factors
 kinesin motor utilization and, 149–50, 160–62

Catenins
 neural crest formation and, 101

regulation of nuclear localization and, 323–26

SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 454

Cation influx
 light-dependent visual transduction in *Drosophila* spp. and, 232, 237, 239, 246–50

caudal gene
 vertebrate endoderm development and, 401

CCA1 gene
 switching to flowering and, 527, 535

CD95
 lymphocyte cell death and, 115, 125

Cdc4
 SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 447–48

Cdc34
 SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 435, 448, 451, 455–56

Cdc42 GTPase
 cell polarity in yeast and, 365–80

Cdc53
 SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 445

Cdc53/cullin
 SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 449–50

cds gene
 visual transduction in *Drosophila* spp. and, 232, 237

Cdx genes
 vertebrate endoderm development and, 396, 401

CED-4 protein
caspase activation during apoptosis and, 278, 282

Cell cycle
ADF/cofilin family proteins and, 210–11
cell polarity in yeast and, 366, 371
kinesin motor utilization and, 144, 146, 152, 158, 160, 164–68
regulation of nuclear localization and, 305–7, 313, 328

SCF and
Ring-H2/Cullin-based ubiquitin ligases, 449, 451

Cell differentiation
Dictyostelium spp.
integration of signaling networks and, 469–505
signaling network for *Dictyostelium* spp. and, 469–505
vertebrate endoderm development and, 393, 403–5

Cell fate
signaling network for *Dictyostelium* spp. and, 469

Cell-free systems
synaptic vesicle biogenesis and, 733, 768–70

Cell migration
ADF/cofilin family proteins and, 185, 211
neural crest formation and, 81, 92–94, 99–101, 104
vertebrate endoderm development and, 396

Cell motility
ADF/cofilin family proteins and, 185–86

Cell polarity
yeast and

actin, 382–83
asymmetric control of cell fate, 367–68
Bud3, 371–72
Bud4, 371–72
Bud10, 371–72
budding in cell-type-specific patterns, 368–74
building axis in chosen direction, 377–82
Cdc42 GTPase, 377–80
choosing direction for polarization, 368–74
cytoskeleton, 379–80, 382–84
description of polarized yeast cell, 366–67
future research, 384–85
introduction, 366–68
mating signal transduction, 376
mating toward a partner, 375–77
mechanism of choosing bud site in axial pattern, 369–72
mechanism of choosing bud site in bipolar pattern, 372–74
microtubules, 383
miscellaneous factors, 381–82
orienting axes for budding and mating, 368–74
pathway for orienting toward a partner, 377
polarity establishment machinery, 377
regulation by cell type, 374–77
Rho GTPases, 380
Rho1, 380–81
Rho2, 380–81
Rho3, 381
Rho4, 381

secretory machinery, 382–84
steps in polarizing cell, 368

Cell proliferation
lymphocyte cell death and, 113

Cell sorting
synaptic vesicle biogenesis and, 733–84

Cell specification
lymphocyte cell death and, 122–23
neural crest formation and, 86–93
signaling network for *Dictyostelium* spp. and, 469–505
switching to flowering and, 537–39
vertebrate endoderm development and, 393–405

Cell surface death receptors
caspase activation during apoptosis and, 269, 271, 274–77

Cell-type proportioning
signaling network for *Dictyostelium* spp. and, 491–94

CENP-E protein
kinesin motor utilization and, 152–53, 162

Central nervous system (CNS)
neural crest formation and, 88, 99–100

Centrioles
kinesin motor utilization and, 143

Centromeres
switching to flowering and, 528

CENTRORADIALIS gene
switching to flowering and, 524

Centrosomes
 ADF/cofilin family
 proteins and, 211
 kinesin motor utilization
 and, 143, 158–59
 SCF and
 Ring-H2/Cullin-based
 ubiquitin ligases, 449–50

Ceramide
 lymphocyte cell death and,
 125

Cerberus factor
 neural induction and, 399,
 415, 417, 427

Chaperones
 actin-related proteins and,
 358

CH domains
 SCF and
 Ring-H2/Cullin-based
 ubiquitin ligases, 459

CHI gene
 blue-light photoreceptors
 in higher plants and,
 39–40

Chicks
 ADF/cofilin family
 proteins and, 187–88,
 192, 195, 203, 218
 neural crest formation and,
 81–84, 86–87, 89, 91, 94,
 96, 98
 neural induction and,
 421–22, 424, 426
 vertebrate endoderm
 development and, 393,
 397, 399

Chimeras
 ADF/cofilin family
 proteins and, 213–14
 kinesin motor utilization
 and, 150, 161
 SCF and
 Ring-H2/Cullin-based
 ubiquitin ligases, 448
 switching to flowering and,
 524

Chlamydomonas spp.
 blue-light photoreceptors
 in higher plants and,
 42–43
 kinesin motor utilization
 and, 156–57

Clathrin
 adaptors for
 clathrin-mediated traffic
 and, 705–24
 synaptic vesicle biogenesis
 and, 733, 748–51, 770–75

CLF gene
 switching to flowering and,
 528

chordin gene
 neural crest formation and,
 83
 neural induction and,
 419–24

Chromophores
 blue-light photoreceptors
 in higher plants and, 33,
 37, 47, 53
 visual transduction in
Drosophila spp. and, 243

Chromosomes
 kinesin motor utilization
 and, 143–44, 147–49,
 152–53, 162, 164, 168–69

CHS gene
 blue-light photoreceptors
 in higher plants and,
 39–40

Ci gene
 kinesin motor utilization
 and, 162

Cilia
 kinesin motor utilization
 and, 148, 150, 156

Circadian rhythms
 blue-light photoreceptors
 in higher plants and, 33,
 43–44, 53
 regulation of nuclear
 localization and, 314

cla4 gene

cell polarity in yeast and,
 379

Cleavage
 caspase activation during
 apoptosis and, 269

Cloning
 switching to flowering and,
 519–44

Coated pits
 clathrin-mediated traffic
 and, 705, 722–23

co gene
 switching to flowering and,
 533–36, 539, 543

Coiled coils
 actin-microtubule
 cooperation and, 66, 75
 ADF/cofilin family
 proteins and, 186
 kinesin motor utilization
 and, 145–46

Col gene
 switching to flowering and,
 525, 527

Collisional quenchers
 translocons and
 endoplasmic reticulum
 membrane, 809

Colon cancer
 vertebrate endoderm
 development and, 401

Compartmentation
 ADF/cofilin family
 proteins and, 199
 nuclear transport and,
 607–43
 synaptic vesicle biogenesis
 and, 736–52

Competence
 ectodermal
 neural induction and,
 416

Compound eye
 visual transduction in
Drosophila spp. and,
 231–59

Concentration-dependent

ectodermal patterning
neural induction and,
416–17

Conserved motor domain
kinesin superfamily and,
141–71

cop genes
blue-light photoreceptors
in higher plants and, 38,
40, 52

Copy DNA (cDNA)
ADF/cofilin family
proteins and, 188, 218
HIF-1 and O₂ homeostasis,
552–53
translocons and
endoplasmic reticulum
membrane, 804

COS cells
neural induction and, 421

Co-stimulation
lymphocyte cell death and,
113

Cotranslation protein
translocation
endoplasmic reticulum
membrane and, 799–832

CPHI gene
blue-light photoreceptors
in higher plants and, 42

Craniofacial cartilage
neural crest formation and,
81, 96, 98

CRIB motif
cell polarity in yeast and,
379

CRM1 protein
nuclear transport and,
633–36

Crm1 receptor
regulation of nuclear
localization and, 304–5,
308, 321–22

CrmA protein
caspase activation during
apoptosis and, 276

Cross-linking

kinesin motor utilization
and, 150, 158–60

Cross-talk
lymphocyte cell death and,
128

cry genes
blue-light photoreceptors
in higher plants and,
34–35, 37, 40–44, 46,
50–53
switching to flowering and,
534–35

Cryptochromes
blue-light photoreceptors
in higher plants and, 33,
35–44, 51
switching to flowering and,
534

C-terminal domains
actin-microtubule
cooperation and, 66
actin-related proteins and,
343
adaptors for
clathrin-mediated traffic
and, 707

ADF/cofilin family
proteins and, 192, 219
blue-light photoreceptors
in higher plants and, 33,
41, 43, 51
caspase activation during
apoptosis and, 274–75,
281

kinesin motor utilization
and, 145, 148, 150, 160,
164, 166–68

neural crest formation and,
97

[*PSI*+] factor and, 666

regulation of nuclear
localization and, 304

SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 443–44,
447, 450–51, 456

translocons and

endoplasmic reticulum
membrane, 811, 815,
822–23

visual transduction in
Drosophila spp. and,
244–45, 254

CVT pathway
vacuolar import of proteins
and organelles from
cytoplasm, 8–18, 28

Cyclic adenosine
monophosphate (cAMP)
ADF/cofilin family
proteins and, 199, 206
regulation of nuclear
localization and, 316–17
signaling network for
Dictyostelium spp. and,
469–505

Cyclic guanosine
monophosphate (cGMP)
visual transduction in
Drosophila spp. and,
238–39, 248

Cyclin B
regulation of nuclear
localization and, 306–8,
329

Cycloheximide
vacuolar import of proteins
and organelles from
cytoplasm, 19

Cyclophilin D
caspase activation during
apoptosis and, 279

Cyclosporin A
caspase activation during
apoptosis and, 279

Cysteine
lymphocyte cell death and,
123

regulation of nuclear
localization and, 321

SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 446,
455

Cystic fibrosis
vertebrate endoderm development and, 394

Cytchalasin D
actin-microtubule cooperation and, 68

Cytochrome c
caspase activation during apoptosis and, 269, 277-84
lymphocyte cell death and, 125-26

Cytokines
ADF/cofilin family proteins and, 185-86
caspase activation during apoptosis and, 272
vertebrate endoderm development and, 404

Cytoplasm
ADF/cofilin family proteins and, 190, 199, 207, 219
kinesin motor utilization and, 158, 163-66
lymphocyte cell death and, 115-16, 120-21, 126
nuclear transport and, 607
[PSI⁺] factor and, 670-71
regulation of nuclear localization and, 292-329
signaling network for *Dictyostelium* spp. and, 469-505
vacuolar import or proteins and organelles from, 1-28
visual transduction in *Drosophila* spp. and, 240, 244

Cytoplasmic anchoring
regulation of nuclear localization and, 322-26

Cytoplasmic localization domain
regulation of nuclear localization and, 314-15

Cytoskeleton

actin-microtubule cooperation and, 63-64, 68-69, 73, 75
ADF/cofilin family proteins and, 217
cell polarity in yeast and, 365, 377, 379-80, 382-84
kinesin motor utilization and, 142
neural crest formation and, 99

Cytosol
adapters for clathrin-mediated traffic and, 705-24
lymphocyte cell death and, 120
synaptic vesicle biogenesis and, 768-84
translocons and endoplasmic reticulum membrane, 813, 831
vacuolar import of proteins and organelles from cytoplasm, 2, 5-6, 8-9, 11-13, 17-19, 23, 27
viral interference and MHC class I, 594-97

D

***Dbt* gene**
regulation of nuclear localization and, 316

***ddm1* gene**
switching to flowering and, 529

Deactivation
visual transduction in *Drosophila* spp. and, 237, 243-45, 254

Death domains
caspase activation during apoptosis and, 274, 276
lymphocyte cell death and, 116-17, 119-22

Death-inducing signaling complex (DISC)

caspase activation during apoptosis and, 269, 275

Default model
neural induction and, 411-27

Dendrites
actin-microtubule cooperation and, 70, 72
actin-related proteins and, 353
ADF/cofilin family proteins and, 216
kinesin motor utilization and, 144, 148-49, 159

Depactin
ADF/cofilin family proteins and, 187

Dephosphorylation
ADF/cofilin family proteins and, 191, 203-7, 209, 211
synaptic vesicle biogenesis and, 783-84
visual transduction in *Drosophila* spp. and, 244

Depolymerization
ADF/cofilin family proteins and, 188, 193-97
couplers
kinesin motor utilization and, 145, 150, 160-62

Destrin
ADF/cofilin family proteins and, 193

Desulfovibrio vulgaris
blue-light photoreceptors in higher plants and, 47

Determinancy
switching to flowering and, 524

Determinant-specific blockade
viral interference and MHC class I, 583-84

***det* genes**
blue-light photoreceptors

in higher plants and, 38, 40
Development
 HIF-1 and O₂ homeostasis, 551–71
 lymphocyte cell death and, 113
 switching to flowering and, 519–44
 vertebrate endoderm and, 393–405
DFR gene
 blue-light photoreceptors in higher plants and, 40
Diabetes
 vertebrate endoderm development and, 394, 402
Diacylglycerol
 visual transduction in
 Drosophila spp. and, 232, 237–39, 246–47
Dictyostelium discoideum
 actin-related proteins and, 354
 ADF/cofilin family
 proteins and, 188–89, 195, 211, 213–14, 218
 differentiation and integration of signaling networks
 aggregation, 470–71
 cAMP as morphogen, 479–81
 cAMP functions through cARs to regulate cell-type differentiation, 486–89
 cAMP receptors, 471–75
 cAR1, 471–75
 cAR3, 471–75
 cell-type proportioning, 491–505
 developmental switch from aggregation to multicellular development, 477–79
 DIF, 479–81
 formation of multicellular organism, 470–71
 GBF transcription factor, 47–86
 genetics, 481–86
 intracellular cAMP activates cAMP-dependent protein kinase, 476–77
 intracellular responses elicited by extracellular cAMP, 475–76
 introduction, 470
 molecular pathways, 471–91
 morphogens, 479–81
 perspective, 505
 prespore populations, 479–81
 prestalk populations, 479–81
 protein kinase A, 489–91
 SDF1, 500–2
 SDF2, 500–2
 signaling pathways controlling terminal differentiation, 494–505
 STATa regulates stalk differentiation, 503–5
 transcriptional regulation of terminal differentiation, 502–3
 SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 441, 449
 DIF-1 morphogen
 signaling network for
 Dictyostelium spp. and, 469, 479–81
 dilute mutation
 actin-microtubule cooperation and, 63, 67, 69–70
 Dimerization
 actin-microtubule

cooperation and, 65–66
blue-light photoreceptors in higher plants and, 45, 48
caspase activation during apoptosis and, 275
HIF-1 and O₂ homeostasis, 557–58
kinesin motor utilization and, 150, 159
regulation of nuclear localization and, 309–11
visual transduction in
 Drosophila spp. and, 245
dino gene
 neural induction and, 423
Diphtheria toxin
 caspase activation during apoptosis and, 280
Diploidy
 cell polarity in yeast and, 366, 371–75
 [*PSI*+] factor and, 665, 670
Direct cleavage
 caspase activation during apoptosis and, 269
Diva protein
 caspase activation during apoptosis and, 282
Diversification
 neural crest formation and, 81, 102–4
 nuclear transport and, 623–42
Dimethyl sulfoxide (DMSO)
 ADF/cofilin family proteins and, 202
DNA-binding domains
 HIF-1 and O₂ homeostasis, 557–58
 regulation of nuclear localization and, 318–19
DNA photolyases
 blue-light photoreceptors in higher plants and, 33, 37–38, 43, 52
Dodecamerization

vacuolar import of proteins and organelles from cytoplasm, 9, 11
Donor membranes
 synaptic vesicle biogenesis and, 733, 739–44, 747–51
Double-labeling technique
 vacuolar import of proteins and organelles from cytoplasm, 21
Downstream effectors
 visual transduction in *Drosophila* spp. and, 245–46
Downstream events
 blue-light photoreceptors in higher plants and, 33, 48, 52
dpp gene
 neural induction and, 419, 424
Drosophila melanogaster
 actin-related proteins and, 350, 357
 ADF/cofilin family proteins and, 204, 211, 218
 blue-light photoreceptors in higher plants and, 44, 47
 caspase activation during apoptosis and, 271, 273, 283
 cell polarity in yeast and, 381
 kinesin motor utilization and, 152, 155–56, 159–60, 162, 167, 170
 neural induction and, 415–16, 419, 424
 regulation of nuclear localization and, 311–12, 314–16, 323, 325–26
SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 439, 442, 452
synaptic vesicle biogenesis
 and, 749–50, 775–77
 translocons and
 endoplasmic reticulum membrane, 804
 visual transduction and, 231–59
Duodenum
 vertebrate endoderm development and, 404–5
Dynactin
 actin-related proteins and, 341, 344, 346–48
 kinesin motor utilization and, 168
Dynamin
 synaptic vesicle biogenesis and, 733, 775–78
Dynamin-interacting proteins
 synaptic vesicle biogenesis and, 775–78
Dynein
 actin-microtubule cooperation and, 65, 69, 76
 actin-related proteins and, 341
 kinesin motor utilization and, 143, 151, 153, 155, 157, 163–64, 166, 168
E
E6-AP ligase
SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 455
Ear domain
 α chain
 adaptors for clathrin-mediated traffic and, 710–11
Ectoderm
 neural induction and, 411–27
Effector cells
 lymphocyte cell death and, 114–28
EF hands
 visual transduction in *Drosophila* spp. and, 240–41
Egl-1 protein
 caspase activation during apoptosis and, 282
Electroretinogram (ERG)
 visual transduction in *Drosophila* spp. and, 233, 236–37, 248
elf genes
 switching to flowering and, 527–28, 535
elg gene
 switching to flowering and, 528
Elongin C
SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 457, 459–60
Embryos
 ADF/cofilin family proteins and, 201, 214–15
 cell polarity in yeast and, 365–85
 HIF-1 and O₂ homeostasis, 551–71
 neural crest formation and, 81–104
emf genes
 switching to flowering and, 528
En-2 gene
 neural crest formation and, 89–90
Endocytosis
 adaptors for clathrin-mediated traffic and, 705–24
 early
 synaptic vesicle biogenesis and, 761–62
fluid-phase
 ADF/cofilin family proteins and, 185, 219

Endoderm development
vertebrate
A-P patterning of early endoderm, 396–97
budding of organs, 403–5
cell differentiation, 403–5
duodenum, 404–5
endoderm formation, 394–97
fate map, 397–98
future research, 405
gastrulation, 394–95
gut tube formation and patterning, 397–403
hindgut, 401
introduction, 393–94
liver, 399
lung, 403–4
mesenchymal/epithelial interactions, 403–5
morphogenetic movements, 397–98
pancreas, 399–405
regulation of endoderm cell fate, 395–96
signal transduction, 398–401
stomach, 404–5
transcription factors, 401–3

Endonucleases
regulation of nuclear localization and, 305–6

Endoplasmic reticulum
actin-microtubule cooperation and, 72
kinesin motor utilization and, 148–49, 153–54, 165
membrane
translocons and, 799–832
regulation of nuclear localization and, 322–23
synaptic vesicle biogenesis and, 734

vacuolar import of proteins and organelles from cytoplasm, 3, 8, 27
viral interference and MHC class I, 588–91

Endosomes
adaptors for clathrin-mediated traffic and, 705–24
synaptic vesicle biogenesis and, 733, 739–40

ENO1 gene
HIF-1 and O₂ homeostasis, 568

Envelope
nuclear
regulation of nuclear localization and, 292–329

Environmental cues
switching to flowering and, 519–44
vacuolar import of proteins and organelles from cytoplasm, 1

EPAS gene
HIF-1 and O₂ homeostasis, 565

Epidermal cells
neural crest formation and, 81–104
neural induction and, 413

Epigenetic modulation
translation termination efficiency and, 661–96

EPO gene
HIF-1 and O₂ homeostasis, 554–55, 561, 564

EPS15
synaptic vesicle biogenesis and, 774

Epsin
synaptic vesicle biogenesis and, 774

Epstein-Barr virus (EBV)
lymphocyte cell death and, 127

erecta gene
switching to flowering and, 525

ERK2 protein
regulation of nuclear localization and, 329

Erythropoietin
HIF-1 and O₂ homeostasis, 551, 554–55, 561, 564

ES cells
HIF-1 and O₂ homeostasis, 564–65

Escherichia coli
blue-light photoreceptors in higher plants and, 36–37, 41, 43, 47

SCF and
Ring-H2/Cullin-based ubiquitin ligases, 444, 446, 448

esd4 gene
switching to flowering and, 528

Ethanol
vacuolar import of proteins and organelles from cytoplasm, 19–20, 23, 27

Eukaryotic cells
ADF/cofilin family proteins and, 185–219
cell polarity in yeast and, 365–85
kinesin motor utilization and, 141–71
nuclear transport and, 607–43
regulation of nuclear localization and, 292–329
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 435–61
vacuolar import of proteins and organelles from cytoplasm, 1–28

Eukaryotic initiation factor 4A (eIF-4A)
neural induction and, 425

Evolution

- kinesin motor utilization and, 165
- vertebrate endoderm development and, 401

Exclusion signals

- synaptic vesicle biogenesis and, 762–65

Exportins

- nuclear transport and, 607–43
- regulation of nuclear localization and, 292–329
- switching to flowering and, 530

Extracellular signals

- lymphocyte cell death and, 113

Eye

- visual transduction in *Drosophila* spp. and, 231–59

Ezrin

- ADF/cofilin family proteins and, 209

F

F-actin

- ADF/cofilin family proteins and, 185–88, 191, 193–96, 201, 213–14, 219

FAST-1 gene

- neural crest formation and, 97

Fate map

- vertebrate endoderm development and, 397–98

F boxes

- SCF and
 - Ring-H2/Cullin-based ubiquitin ligases, 435, 444–48, 450–51, 457–59

FCA gene

- switching to flowering and, 529–33, 536, 539, 543

fd gene

- switching to flowering and, 533, 536–37

fe gene

- switching to flowering and, 533, 536–37

Fetuses

- HIF-1 and O₂ homeostasis, 551–71

fgr genes

- vertebrate endoderm development and, 395, 403–4

Fgr^{-/-} gene

- vertebrate endoderm development and, 396

fha gene

- blue-light photoreceptors in higher plants and, 42
- switching to flowering and, 534

Fibroblast growth factor (FGF)

- neural crest formation and, 81, 86, 88–89, 91–93, 95
- neural induction and, 425–26
- vertebrate endoderm development and, 395–97, 403–4

Fibroblasts

- ADF/cofilin family proteins and, 199, 201, 213, 215–16
- cell polarity in yeast and, 385
- kinesin motor utilization and, 153

Filaments

- actin
 - actin-microtubule cooperation and, 63, 65, 68–71, 74
 - actin-related proteins and, 344, 351–53
 - ADF/cofilin family proteins and, 185–219

visual transduction in *Drosophila* spp. and, 256

kinesin motor utilization and, 142, 158

Fish

- actin-microtubule cooperation and, 66, 68–69

Fission

- synaptic vesicle biogenesis and, 733, 747

Fkh6 gene

- vertebrate endoderm development and, 404

FKR gene

- switching to flowering and, 525

fla10 gene

- kinesin motor utilization and, 157

Flagella

- kinesin motor utilization and, 148, 156–57

Flavoproteins

- blue-light photoreceptors in higher plants and, 33

FLC gene

- switching to flowering and, 525, 527–28, 530–33, 540–41, 543

fld gene

- switching to flowering and, 529

FLIP protein

- lymphocyte cell death and, 115, 121–22

Floral meristem identity genes

- switching to flowering and, 519, 537–42

Floral transition

- Arabidopsis* spp and, 519–44

Flowering

- when to switch to activation of floral

meristem identity genes, 539–40
autonomous promotion pathway, 529–32
determinacy of apex, 524
FT subgroup, 536–37
genes promoting floral transition, 529–37
genes repressing floral transition, 526–29
genes specifying floral meristems, 537–39
gibberellic acid promotion pathway, 533–34
interaction of pathways, 541–43
introduction, 521
multiple pathways regulating floral transition, 525–37
perspectives, 544
phase transition, 522–25
photoperiod promotion pathway, 534–36
primordia identity, 524–25
putting component pathways together, 540–41
relative importance of pathways controlling floral transition change in time and space, 543
reproductive phase change, 522–23
reversion of phase transitions, 524
robust network controlling floral transition, 543
shoot apical meristem, 522–25
vegetative phase change, 522–23
vernalization promotion pathway, 532–33

Focusers
kinesin motor utilization and, 150

follistatin gene
neural crest formation and, 84
neural induction and, 415, 417, 420–22

fpa gene
switching to flowering and, 530–31, 533, 536

FPFI gene
switching to flowering and, 533

FRI gene
switching to flowering and, 525, 527–28, 531–33, 540–41, 543

Frogs
actin-microtubule cooperation and, 66–69
neural crest formation and, 91
neural induction and, 411–27
vertebrate endoderm development and, 393

Fructose-1,6-biphosphatase vacuolar import of proteins and organelles from cytoplasm, 26–27

Fruiting bodies
signaling network for *Dicystostelium* spp. and, 469–505

FT genes
switching to flowering and, 519, 526, 533, 536–37, 540–43

FTS gene
switching to flowering and, 529

Fungi
ADF/cofilin family proteins and, 219
blue-light photoreceptors in higher plants and, 46
kinesin motor utilization and, 146, 154, 164, 166
[*PSI*+] factor and, 666, 695

fus genes
blue-light photoreceptors in higher plants and, 38, 40

fve gene
switching to flowering and, 529, 531, 533, 536, 539

fwa gene
switching to flowering and, 529, 533, 536–37

fy gene
switching to flowering and, 529

G

gal gene
switching to flowering and, 534, 539

ga gene
switching to flowering and, 533

gai gene
switching to flowering and, 533–34

Gain-of-function mutations vacuolar import of proteins and organelles from cytoplasm, 18

GAP genes
blue-light photoreceptors in higher plants and, 39

garnet gene
synaptic vesicle biogenesis and, 750, 775

Gastrointestinal (GI) tract vertebrate endoderm development and, 393–405

Gastrulation neural induction and, 411–27
vertebrate endoderm development and, 393–95

Gata1 gene neural induction and, 417

GBF transcription factor signaling network for *Dictyostelium* spp. and, 467, 469, 477–79, 481–86

Gelsolin ADF/cofilin family proteins and, 192–94, 200

Geminin neural induction and, 424

Genetics actin-microtubule cooperation and, 63, 72–75

actin-related proteins and, 341, 349–50, 356

adaptors for clathrin-mediated traffic and, 705–24

ADF/cofilin family proteins and, 185–219

blue-light photoreceptors in higher plants and, 33, 36–37, 41

caspase activation during apoptosis and, 278–79

cell polarity in yeast and, 367–74, 376, 384

HIF-1 and O₂ homeostasis, 551–71

kinesin motor utilization and, 146, 148–49, 151–52, 154–58, 163–64, 166–67, 170

lymphocyte cell death and, 119, 127

neural crest formation and, 81–104

neural induction and, 414, 416–17, 419, 421–25, 427

[PSI⁺] factor and, 661–96

regulation of nuclear localization and, 301, 311, 316

signaling network for *Dictyostelium* spp. and, 481–86

switching to flowering and, 519–44

vacuolar import of proteins and organelles from cytoplasm, 7–10, 13–17, 25–28

vertebrate endoderm development and, 395–405

viral interference and MHC class I, 579, 599–600

visual transduction in *Drosophila* spp. and, 231–59

Germ layers vertebrate endoderm development and, 393

GFP-SKL construct vacuolar import of proteins and organelles from cytoplasm, 21

Gibberellic acid pathway switching to flowering and, 524, 526, 533–34, 541–43

gid gene vacuolar import of proteins and organelles from cytoplasm, 27

gi gene switching to flowering and, 533, 535–36, 539

Gliding ADF/cofilin family proteins and, 209

Gli proteins neural crest formation and, 97

Glucocorticoid receptor regulation of nuclear localization and, 317–20

Glucose vacuolar import of proteins and organelles from cytoplasm, 19–20, 22–23, 27

Glucose-induced selective autophagy genes

vacuolar import of proteins and organelles from cytoplasm, 25–26

Glucose transporters HIF-1 and O₂ homeostasis, 551, 555

Glutamate actin-microtubule cooperation and, 72

ADF/cofilin family proteins and, 217

Golgi complex actin-microtubule cooperation and, 65, 72, 74

kinesin motor utilization and, 148–49, 153–56, 164–65, 170

synaptic vesicle biogenesis and, 734–46

vacuolar import of proteins and organelles from cytoplasm, 2–3, 8, 15, 27

G proteins actin-related proteins and, 356

ADF/cofilin family proteins and, 205

cell polarity in yeast and, 385

kinesin motor utilization and, 170

SCF and Ring-H2/Cullin-based ubiquitin ligases, 454

visual transduction in *Drosophila* spp. and, 231–32, 236–39, 245–46, 251, 258–59

Growth cones neuronal ADF/cofilin family proteins and, 185, 208

Growth factors neural crest formation and,

81, 86, 88–93, 95, 104
neural induction and,
412–13, 420, 423, 425–26
vertebrate endoderm
development and, 393,
395–97, 403–5

GSA genes
vacuolar import of proteins
and organelles from
cytoplasm, 25–26

GSK-3 protein
signaling network for
Dictyostelium spp. and,
469

GTPases
cell polarity in yeast and,
365, 377–80
neural crest formation and,
101
translocons and
endoplasmic reticulum
membrane, 813–14,
832

GTP-binding proteins
synaptic vesicle biogenesis
and, 775–79

**Guanosine triphosphate
(GTP)**
actin-related proteins and,
355

Gut tube
vertebrate endoderm
development and, 393,
397–403

H

Hairpins
caspase activation during
apoptosis and, 280

Halobacterium halobium
blue-light photoreceptors
in higher plants and, 47

Hansenula polymorpha
vacuolar import of proteins
and organelles from
cytoplasm, 23–25

Haploidy

cell polarity in yeast and,
366, 371–76
regulation of nuclear
localization and, 305, 313
***hasty* gene**
switching to flowering and,
522

Heat shock proteins
[*PSI*+] factor and, 672,
678–80, 686

HECT domain
SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 455

***hedgehog* gene**
kinesin motor utilization
and, 149

α-Helicity
actin-microtubule
cooperation and, 66

ADF/cofilin family
proteins and, 186, 191–92

blue-light photoreceptors
in higher plants and, 36

kinesin motor utilization
and, 145–46

regulation of nuclear
localization and, 312

translocons and
endoplasmic reticulum
membrane, 829

Helix-loop-helix motif
HIF-1 and O₂ homeostasis,
551–71

Hensen's node
neural induction and, 421

HepG2 cells
HIF-1 and O₂ homeostasis,
564

HERG potassium channel
blue-light photoreceptors
in higher plants and,
47–48

Herpesviridae
viral interference and MHC
class I, 588–91

***Hesx1* gene**

vertebrate endoderm
development and, 396–97

Heterodimerization
HIF-1 and O₂ homeostasis,
551–71

SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 448, 455

Heteromultimeric channels
visual transduction in
Drosophila spp. and,
249–50

Hetero-oligomeric complexes
synaptic vesicle biogenesis
and, 757–58

Heterotrimerization
ADF/cofilin family
proteins and, 205

cell polarity in yeast and,
376

SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 454

visual transduction in
Drosophila spp. and, 232,
238–39, 245–46, 259

Hex1 transcription factor
vertebrate endoderm
development and, 399

Hif1a^{-/-} mice
HIF-1 and O₂ homeostasis,
564–66, 568

Higher plants
blue-light photoreceptors
in higher plants and,
33–53

Higher vertebrates
lymphocyte cell death and,
113–14

Hindgut
vertebrate endoderm
development and, 401

Hippocampus
ADF/cofilin family
proteins and, 191

Hirano bodies
ADF/cofilin family

proteins and, 216–17

Histidine

- SCF and
- Ring-H2/Cullin-based ubiquitin ligases, 446

Histidine kinase

- signaling network for *Dicytostelium* spp. and, 469, 495–98, 501

Histones

- regulation of nuclear localization and, 327

HL-60 cells

- ADF/cofilin family proteins and, 212

HNF gene

- vertebrate endoderm development and, 402

Hodgkin's disease

- lymphocyte cell death and, 126–27

Hog1 protein

- regulation of nuclear localization and, 310–11, 327

HO gene

- cell polarity in yeast and, 367

Homeobox genes

- neural crest formation and, 97
- vertebrate endoderm development and, 400

Homeostasis

- lymphocyte cell death and, 128
- mammalian O₂

HIF1 and, 551–71

Homomultimerization

- visual transduction in *Drosophila* spp. and, 250, 256–57

Homo-oligomeric complexes

- synaptic vesicle biogenesis and, 757

Homo sapiens

- [PSI+] factor and, 666

SCF and

- Ring-H2/Cullin-based ubiquitin ligases, 440–42, 452–53

Homotrimeric proteins

- lymphocyte cell death and, 116
- hox* genes
- vertebrate endoderm development and, 400–2

Hrt1 protein

- SCF and
- Ring-H2/Cullin-based ubiquitin ligases, 446, 450

Hsp90 protein

- regulation of nuclear localization and, 318–19

Hsp104 protein

- [PSI+] factor and, 672, 678–80, 686

Human immunodeficiency virus (HIV)

- ADF/cofilin family proteins and, 209

Hydrolases

- vacuolar import of proteins and organelles from cytoplasm, 1

Hydrolysis

- ADF/cofilin family proteins and, 202–3
- nuclear transport and, 618–19

Hydrophilicity

- translocons and endoplasmic reticulum membrane, 809
- vacuolar import of proteins and organelles from cytoplasm, 16

Hydrophobicity

- visual transduction in *Drosophila* spp. and, 254

hy genes

- blue-light photoreceptors in higher plants and, 36–40, 43

switching to flowering and, 535

Hypoxia-inducible factor 1 (HIF-1)

- mammalian O₂ homeostasis and apoptosis, 568 cellular responses, 566–67 development, 564–66 dimerization, 557–58 DNA-binding domains, 557–58 future research, 571 HIF1α, 556–60, 568–70 human cancers, 569–70 human tumor cell lines, 569–70 introduction, 552 isolation of cDNA sequences, 552–53 messenger RNA, 560 nuclear localization signals, 560 oncogenic activation, 568–69 physiologic activation, 568 protein stability domains, 559–60 purification of HIF-1, 552–53 regulation of HIF-1 activity, 560–64 structure-function analysis of HIF-1, 556–60 systemic responses, 566–67 target genes transactivated by HIF-1, 554–56 transactivation domains, 558–59 tumor progression, 566–70

I

IAP proteins
caspase activation during apoptosis and, 269, 283–84

Ice plant
blue-light photoreceptors in higher plants and, 46

IGF2 gene
HIF-1 and O₂ homeostasis, 569

Immune system
cell polarity in yeast and, 365–85

lymphocyte cell death and, 113–28

viral interference and MHC class I, 579–601

Importins
nuclear transport and, 607–43

regulation of nuclear localization and, 292–329

INAD protein
visual transduction in *Drosophila* spp. and, 232, 240–41, 254–59

ina genes
visual transduction in *Drosophila* spp. and, 232, 237, 252–53, 255, 258

Induction
neural crest formation and, 81–85

neural induction and, 411–27

[*PSI*+] factor and, 692–93

switching to flowering and, 530, 542

Infection
lymphocyte cell death and, 113

Inositol-1,3,5-triphosphate (IP3)
visual transduction in *Drosophila* spp. and, 232, 239, 246–47

J

JUVE gene
switching to flowering and, 525

K

Kar2p protein
translocons and endoplasmic reticulum membrane, 802, 824

Kar9 gene
cell polarity in yeast and, 383

Keratinocytes
actin-microtubule cooperation and, 67

ADF/cofilin family proteins and, 216

KFERQ motif
vacuolar import of proteins and organelles from cytoplasm, 26–27

Kidney cells

Internal resources
switching to flowering and, 519–44

Intraflagellar transport
kinesin motor utilization and, 157

IQGAP proteins
cell polarity in yeast and, 380

Ischemia
HIF-1 and O₂ homeostasis, 551–71

Ischemic kidney disease
ADF/cofilin family proteins and, 217–18

Isl-1 gene
vertebrate endoderm development and, 402, 405

Isoforms
ADF/cofilin family proteins and, 195, 197–98, 215, 218

J

JUVE gene
switching to flowering and, 525

K

Kar2p protein
translocons and endoplasmic reticulum membrane, 802, 824

Kar9 gene
cell polarity in yeast and, 383

Keratinocytes
actin-microtubule cooperation and, 67

ADF/cofilin family proteins and, 216

KFERQ motif
vacuolar import of proteins and organelles from cytoplasm, 26–27

Kidney cells

kinesin motor utilization and, 155

Kidney disease
ADF/cofilin family proteins and, 217–18

Kinases
ADF/cofilin family proteins and, 185, 203–7

blue-light photoreceptors in higher plants and, 33, 48

lymphocyte cell death and, 122–23

regulation of nuclear localization and, 316–17

SCF and
Ring-H2/Cullin-based ubiquitin ligases, 454

signaling network for *Dictyostelium* spp. and, 469, 476–77, 495–98

visual transduction in *Drosophila* spp. and, 240–41

Kinesins
actin-microtubule cooperation and, 63, 66, 69, 71, 74–76

motor utilization and
basic principles, 143–47

cargo attachment strategies, 147, 150–70

catastrophe factors, 160–62

chromosomes, 152–53

cross-linking

microtubules, 158–60

depolymerization

couplers, 160–62

functional redundancy, 163–65

functions of kinesins, 147–62

future research, 162–70

genomics, 166–67

introduction, 142

lysosomes, 150–51

melanosomes, 151
 membrane-associated
 rafts, 156–58
 mitochondria, 156
 nature of kinesins,
 162–63
 organelles and vesicles
 in secretory pathway,
 153–56
 perspectives, 170–71
 signaling, 162
 sliding microtubules,
 158–60
 soluble proteins, 156–58
 structural design, 145
 synaptic vesicle
 precursors, 151–52
 thesaurus, 144
 zippering microtubules,
 160–62

Kinetics
 actin-related proteins and,
 352
 ADF/cofilin family
 proteins and, 194
 regulation of nuclear
 localization and, 311
 vacuolar import of proteins
 and organelles from
 cytoplasm, 10
 visual transduction in
Drosophila spp. and, 245

Kinetochores
 kinesin motor utilization
 and, 162
 SCF and
 Ring-H2/Cullin-based
 ubiquitin ligases, 451

Kiss-and-run mode
 synaptic vesicle biogenesis
 and, 747–48

***KLP3A* gene**
 kinesin motor utilization
 and, 164

Knockouts
 caspase activation during
 apoptosis and, 278–79

neural crest formation and,
 84, 90, 96
 neural induction and,
 422–23
***Krox-20* gene**
 neural crest formation and,
 89–90

***KRY* gene**
 switching to flowering and,
 525

L

La³⁺
 visual transduction in
Drosophila spp. and, 249

Large-protein complexes
 actin-related proteins and,
 341

Latrunculin A
 actin-microtubule
 cooperation and, 68
 ADF/cofilin family
 proteins and, 198

Lattices
 ADF/cofilin family
 proteins and, 197

***ld* gene**
 switching to flowering and,
 529, 530–31

***Ler* gene**
 switching to flowering and,
 525, 527, 535–36

Lettuce
 switching to flowering and,
 544

Leucine
 regulation of nuclear
 localization and, 304,
 307, 312, 321

SCF and
 Ring-H2/Cullin-based
 ubiquitin ligases, 446–47
 switching to flowering and,
 530

***LFY* gene**
 switching to flowering and,
 524, 532, 534, 536–42

***LHY* gene**
 switching to flowering and,
 527, 535

Life cycle
 switching to flowering and,
 519–44

Ligand-binding domains
 regulation of nuclear
 localization and, 318–19

Ligases
 SCF and
 Ring-H2/Cullin-based
 ubiquitin ligases, 435–61

Light
 blue-light photoreceptors
 in higher plants and,
 33–53
 visual transduction in
Drosophila spp. and,
 231–59

Light-coincident
 receptor-potential
 (LCRP)
 visual transduction in
Drosophila spp. and, 233,
 235–36

Lily
 ADF/cofilin family
 proteins and, 188

Lim kinases
 ADF/cofilin family
 proteins and, 185, 204–7

Limk1/Limk2 proteins
 ADF/cofilin family
 proteins and, 204–5, 217

Lipids
 synaptic vesicle biogenesis
 and, 759–61, 780–83

Liposomes
 synaptic vesicle biogenesis
 and, 770

Listeria monocytogenes
 actin-related proteins and,
 353, 355

ADF/cofilin family
 proteins and, 212

Liver

vertebrate endoderm development and, 399

LL motif adaptors for clathrin-mediated traffic and, 716–18

LMP1 protein lymphocyte cell death and, 127

Local delivery actin-microtubule cooperation and, 63, 68

Localization nuclear regulation and, 292–329

Long days switching to flowering and, 524–26, 535–36, 540

Long-haul trucks kinesin motor utilization and, 150

Long-range transport actin-microtubule cooperation and, 63

Long-term facilitation regulation of nuclear localization and, 317

Loops actin-related proteins and, 343

Loss-of-function mutations switching to flowering and, 537

LOV domains blue-light photoreceptors in higher plants and, 33, 45–48

Lumenal domains translocons and endoplasmic reticulum membrane, 799–832

Lungs vertebrate endoderm development and, 403–4

Lymphocytes cell polarity in yeast and, 365–85

Lymphocyte survival cell death and adaptor proteins, 120–22 anti-apoptotic pathways, 124–25 apoptosis, 115–16 Bcl-2 family, 124–25 caspases, 123–24 cell surface receptors as triggers of lymphocyte activation, 114–15 cytosol, 120 failure of control mechanisms, 126–28 introduction, 114 kinases, 122–23 mitochondria, 125–26 nucleus, 120 pro-apoptotic pathways, 124–25 protein phosphorylation, 122–23 reversibility, 122–23 signal transduction pathways, 120–25 specificity, 122–23 TNFR superfamily, 116–20

Lymphoma ADF/cofilin family proteins and, 206, 213

Lysine SCF and Ring-H2/Cullin-based ubiquitin ligases, 443, 451, 456 translocons and endoplasmic reticulum membrane, 809 visual transduction in *Drosophila* spp. and, 240–41

Lysophosphatidic acyl transferase synaptic vesicle biogenesis and, 733–84

Lysosomes

kinesin motor utilization and, 147–48, 150–51, 169 vacuolar import of proteins and organelles from cytoplasm, 1 viral interference and MHC class I, 597

M

Macroautophagy vacuolar import of proteins and organelles from cytoplasm, 3–8

Macropexophagy vacuolar import of proteins and organelles from cytoplasm, 23–24

Macrophages ADF/cofilin family proteins and, 212 lymphocyte cell death and, 114, 117

MADS-type transcription factor switching to flowering and, 538

Maize ADF/cofilin family proteins and, 198, 216 blue-light photoreceptors in higher plants and, 35, 45

Major histocompatibility complex (MHC) antigen processing and presentation viral interference and, 579–601 lymphocyte cell death and, 114

Mammalian cells actin-microtubule cooperation and, 69–70 ADF/cofilin family proteins and, 212–13 caspase activation during apoptosis and, 269, 272–73

neural induction and, 420–21

Mating
cell polarity in yeast and, 368–76

Mei2 protein
regulation of nuclear localization and, 313, 329

Meiosis
cell polarity in yeast and, 366

kinesin motor utilization and, 144, 146, 152, 158, 160, 165–67

regulation of nuclear localization and, 313

Melanocytes
actin-microtubule cooperation and, 69–70

Melanophores
actin-microtubule cooperation and, 66–69

Melanosomes
kinesin motor utilization and, 147, 151

Membrane-associated rafts
kinesin motor utilization and, 147–48, 150, 156–58, 167, 169

Membrane budding
synaptic vesicle biogenesis and, 733–84

Membrane traffic
adaptors for clathrin-mediated traffic and, 705–24

Meristem
switching to flowering and, 519–25, 528, 531, 537–42

Mesembryanthemum crystallinum
blue-light photoreceptors in higher plants and, 46

Mesenchymal/epithelial interactions
vertebrate endoderm

development and, 403–5

Mesodermal patterning
neural induction and, 415

Messenger RNA (mRNA)
ADF/cofilin family proteins and, 198–99

blue-light photoreceptors in higher plants and, 40–41, 43–44

cell polarity in yeast and, 367, 371

HIF-1 and O₂ homeostasis, 560–61, 564–66, 568

lymphocyte cell death and, 124

neural crest formation and, 85

nuclear transport and, 607, 637–42

[PSI⁺] factor and, 662

regulation of nuclear localization and, 298

switching to flowering and, 527–28, 531, 533–35

translocons and endoplasmic reticulum membrane, 809

MET1 gene
switching to flowering and, 533

Met4 protein
SCF and Ring-H2/Cullin-based ubiquitin ligases, 458

Metabolism
HIF-1 and O₂ homeostasis, 551

Metalloproteases
neural induction and, 424

Metaphase
kinesin motor utilization and, 159

Metarhodopsin
visual transduction in *Drosophila* spp. and, 238–39, 243–45

Metazoans

signaling network for *Dictyostelium* spp. and, 469–505

Methenyltetrahydrofolate (MTHF)
blue-light photoreceptors in higher plants and, 37

Mg²⁺
visual transduction in *Drosophila* spp. and, 250

Mice
actin-microtubule cooperation and, 63, 67, 69–70

actin-related proteins and, 343

ADF/cofilin family proteins and, 188

neural crest formation and, 84, 87, 94–95

neural induction and, 422–23

vertebrate endoderm development and, 393, 397, 399

Microtubule-based motor proteins
actin-based motor proteins and coordination of multiple motors involved in transport, 74–75

dilute mouse, 69–70

future research, 75–76

genetic studies in yeast, 72–74

introduction, 63, 65

kinesins, 66

melanocytes, 69–70

melanophores, 66–69

myosins, 64–66

neuronal transport, 70–72

organelle transport, 64–66

pigment transport, 66–70

Microtubules

actin-related proteins and, 341
cell polarity in yeast and, 365, 383
kinesin motor utilization and, 141–71
Mitochondria
actin-microtubule cooperation and, 71–72
ADF/cofilin family proteins and, 216–17
caspase activation during apoptosis and, 269, 276–84
cell polarity in yeast and, 366
HIF-1 and O₂ homeostasis, 562
kinesin motor utilization and, 148–49, 156, 165, 169–70
lymphocyte cell death and, 124–26
[*PSI*+] factor and, 671
vacuolar import of proteins and organelles from cytoplasm, 5, 23
Mitogen-activated protein kinase (MAPK)
regulation of nuclear localization and, 308–11
Mitosis

ADF/cofilin family proteins and, 187–88, 200, 208, 210, 214
***myo2* gene**
actin-microtubule cooperation and, 73–74
kinesin motor utilization and, 162
Myoblasts
ADF/cofilin family proteins and, 199
***MyoD* gene**
actin-microtubule cooperation and, 63
Myosins
actin-microtubule cooperation and, 63–76
ADF/cofilin family proteins and, 187, 214
cell polarity in yeast and, 383–84
kinesin motor utilization and, 166, 149
visual transduction in *Drosophila* spp. and, 232, 240–41, 252–54, 257–58

N

Na⁺
visual transduction in *Drosophila* spp. and, 238–41, 246, 248

Nascent proteins
translocons and endoplasmic reticulum membrane, 821–23, 825–26, 831

Natural killer (NK) cells
lymphocyte cell death and, 114, 117, 119

***ncd* gene**
kinesin motor utilization and, 160, 164

Negative feedback regulation
visual transduction in *Drosophila* spp. and, 251–54

Neural crest cells
HIF-1 and O₂ homeostasis, 565

Neural crest formation
molecular mechanisms of BMPs, 86–88
diversification, 102–4
FGFs, 88–89
gene expression at neural plate border, 94–98
migration, 99–101
miscellaneous factors, 97–98
multiple signals, 91–93
multipotency, 102–3
neural crest fate, 98–104
neural induction, 82–85
Pax genes, 95–96
segregation of neural crest lineage, 98–99
Snail family, 94–95
specification of neural crest-forming regions at neural plate border, 86–93
Wnts, 89–91
Zic genes, 96–97

Neural induction
ancillary regulation, 424–25
antagonists, 414–15
bone morphogenetic proteins, 413–16, 424–25
chicks, 421–22
competence of ectoderm, 416
concentration-dependent ectodermal patterning, 416–17
default model, 412–27
Drosophila, 419
epidermal inducers, 413
fibroblast growth factor, 425–26
functional assays, 420
future research, 427
genetics, 420, 422–24

inhibition, 414, 427
knockouts, 422–23
mammalian cell lines, 420–21
mesodermal patterning, 415
mice, 422–23
miscellaneous vertebrates, 419–24
Smad10 protein, 426
steps in neural development, 416–19
translational regulation in gastrula ectoderm, 425
Wnt protein, 427
Xolloid metalloprotease, 424
zebrafish, 423–24

Neuregulin
neural crest formation and, 100

Neurodegenerative disease
ADF/cofilin family proteins and, 216–17

NeuroD gene
vertebrate endoderm development and, 402

Neuroendocrine cells
synaptic vesicle biogenesis and, 733–84

Neurons
actin-microtubule cooperation and, 63, 65, 70–72
ADF/cofilin family proteins and, 185–86, 191, 199, 206, 208
caspase activation during apoptosis and, 278
cell polarity in yeast and, 365
kinesin motor utilization and, 143, 151, 154–59, 165
neural crest formation and, 81–104
neural induction and, 416

synaptic vesicle biogenesis and, 733–84

Neurospora crassa
actin-related proteins and, 347, 349
blue-light photoreceptors in higher plants and, 46
kinesin motor utilization and, 155, 166
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 441
translocons and endoplasmic reticulum membrane, 820

Neurotransmitter transporter sorting
synaptic vesicle biogenesis and, 766–68

NF-κB transcription factor regulation of nuclear localization and, 311–12

NF-AT transcription factor regulation of nuclear localization and, 302–5

nina genes
visual transduction in *Drosophila* spp. and, 232, 236–37, 240–44, 252–53

NINAC
visual transduction in *Drosophila* spp. and, 232, 240–41, 252–54, 257–58

Nitrogen starvation
regulation of nuclear localization and, 313
vacuolar import of proteins and organelles from cytoplasm, 4, 6

Nkx genes
vertebrate endoderm development and, 402

Nocodazole
actin-microtubule cooperation and, 72–73

nodal gene
vertebrate endoderm

development and, 395
nod gene
kinesin motor utilization
and, 164
noggin gene
neural crest formation and,
83–84, 87
neural induction and, 415,
417, 420–22
vertebrate endoderm
development and, 399
Non-methylotrophic yeast
vacuolar import of proteins
and organelles from
cytoplasm, 24–25
Nonsense suppression
[*PSI*+] factor and, 663–64
norpA gene
visual transduction in
Drosophila spp. and, 232,
235–37, 246, 251
NPH genes
blue-light photoreceptors
in higher plants and, 33,
35, 41, 45–49
NPL1 gene
blue-light photoreceptors
in higher plants and,
48–49
npql gene
blue-light photoreceptors
in higher plants and, 50
NPXY motif
adaptors for
clathrin-mediated traffic
and, 711–12
N-terminal domains
actin-related proteins and,
343, 353
adaptors for
clathrin-mediated traffic
and, 708
ADF/cofilin family
proteins and, 189–90, 192
blue-light photoreceptors
in higher plants and, 36,
41, 46, 49

kinesin motor utilization
and, 145
[*PSI*+] factor and, 666,
687–91
regulation of nuclear
localization and, 302,
304, 308
SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 443–44,
447, 457
switching to flowering and,
530
translocons and
endoplasmic reticulum
membrane, 805
vacuolar import of proteins
and organelles from
cytoplasm, 6, 8
visual transduction in
Drosophila spp. and,
240–41, 249

Nuclear export signal
switching to flowering and,
530

Nuclear localization
ADF/cofilin family
proteins and, 185, 190–91
HIF-1 and O₂ homeostasis,
560
regulation and
biological pathways, 328
cargo-receptor complex
formation, 299–321
challenges, 328–29
change in steady-state
localization of a protein,
297
conceptual issues, 329
cyclin B, 306–8
cytoplasmic anchoring,
322–26
future research, 328–29
glucocorticoid receptor,
317–20
introduction, 293–97
mechanisms, 298–328

mechanistic studies,
328–29
Mei2, 313
mitogen-activated
protein kinase, 308–11
NF- κ B, 311–12
NF-AT, 302–5
nuclear pore complex,
327–28
nuclear translocation,
293–97
Period, 314–16
Pho4, 299–305
phosphorylation, 299
protein kinase A, 316–17
redundancy, 298
regulated localization,
298
regulated translocation,
297–328
shuttling vs nonshuttling
proteins, 297–98
signal inactivation, 298
soluble transport
machinery, 326–27
Swi5, 305–6
Timeless, 314–16
tRNA export, 320–21
yAP1, 321–22

Nuclear magnetic resonance
(NMR)
ADF/cofilin family
proteins and, 191

Nuclear pore complexes
nuclear transport and, 607,
609–11, 621
regulation of nuclear
localization and,
298–300, 303, 319, 324,
327–28

Nuclear transport
adaptor molecules, 612
assymetry in RanGTPase
system, 615–16
assymetry in Ran nuclear
import, 616–17
cargo loading, 611–12

compartmentation, 608
CRM1-mediated nuclear export, 633–36
disassembly of transport receptor/RanGTP complexes, 614–15
diversity of nucleocytoplasmic transport pathways, 623–42
energetics, 617–22
future research, 642–43
hydrolysis of Ran-bound GTP and nucleotide exchange, 613
importin β -mediated nuclear import, 627–30
importin β -related nuclear transport receptors, 623–27
introduction, 608–9
mechanistic principles, 611
mRNA export, 637–42
need for nuclear transport, 608
nuclear pore complex passage of simple cargo-receptor complexes not directly coupled to NTP hydrolysis, 618–19
nuclear pore complexes, 609–11, 621–22
nuclear transport independent of importin β -related transport receptors, 636–37
nucleocytoplasmic RanGTP gradient as energy source for directional transport, 620–21
passive diffusion, 609–10
RanGTPase system, 611–16
Ran import mechanism, 616–17
ribosome export, 642
signal-mediated transport, 610–11
translocation through nuclear pore complex, 621–22
transport receptors, 613–15
tRNA export, 630–33
Nucleic acid mutagens [PSI^+] factor and, 671–72
Nucleoside triphosphate (NTP)
nuclear transport and, 618–19
Nucleus
actin-related proteins and, 356–57
ADF/cofilin family proteins and, 209, 219
kinesin motor utilization and, 143, 148, 153, 163–64
lymphocyte cell death and, 115, 120
Null mutants
ADF/cofilin family proteins and, 201
kinesin motor utilization and, 148–49, 151, 154, 156
visual transduction in *Drosophila* spp. and, 258

O

Oats
blue-light photoreceptors in higher plants and, 45

Oligomerization
caspase activation during apoptosis and, 274, 277
kinesin motor utilization and, 145–47
synaptic vesicle biogenesis and, 757–58

Oligopeptides
viral interference and MHC class I, 579–601

Oligosaccharyltransferase

translocons and endoplasmic reticulum membrane, 803, 805–7, 821, 830
Ommatidia
visual transduction in *Drosophila* spp. and, 233–35, 242

Oncogenes
HIF-1 and O_2 homeostasis, 568–69

Open reading frames (ORFs) [PSI^+] factor and, 666–68

Opsins
visual transduction in *Drosophila* spp. and, 240–42

Organelle transport
actin-microtubule cooperation and, 63–76
kinesin motor utilization and, 141–71
vacuolar import from cytoplasm and, 1–28

Organ formation
vertebrate endoderm development and, 393, 403–5

Organ identity genes switching to flowering and, 537–39

Organizer cell cluster
neural induction and, 411

Oscillation
regulation of nuclear localization and, 298, 314

signaling network for *Dictyostelium* spp. and, 471

Otx1 gene
vertebrate endoderm development and, 396

Overexpression
ADF/cofilin family proteins and, 213–16

Oxygen

HIF-1 and O₂ homeostasis, 551–71

P

P19 cells
neural induction and, 420–21

pag genes
vacuolar import of proteins and organelles from cytoplasm, 26

Pancreas
vertebrate endoderm development and, 393, 399–400, 404–5

Pancreatic beta cells
kinesin motor utilization and, 155

Parahox cluster
vertebrate endoderm development and, 401

pasI gene
vacuolar import of proteins and organelles from cytoplasm, 24

PAS domains
blue-light photoreceptors in higher plants and, 33, 47–48

Passive diffusion
nuclear transport and, 609–10

PAS transcription factor
HIF-1 and O₂ homeostasis, 551–71

pavarotti gene
kinesin motor utilization and, 159

Pax genes
neural crest formation and, 82, 89, 91, 95–96
vertebrate endoderm development and, 402

PC12 cells
synaptic vesicle biogenesis and, 733–84

pdd genes

vacuolar import of proteins and organelles from cytoplasm, 25

PdxI gene
vertebrate endoderm development and, 400, 402

PDZ-containing scaffold protein
visual transduction in *Drosophila* spp. and, 231

PDZ domains
visual transduction in *Drosophila* spp. and, 254–57, 259

Pea
blue-light photoreceptors in higher plants and, 40, 44, 46
switching to flowering and, 544

pef genes
switching to flowering and, 528

Period protein
regulation of nuclear localization and, 314–16, 329

Peripheral nervous system (PNS)
neural crest formation and, 81

Permeability barrier
translocons and endoplasmic reticulum membrane, 799, 810, 821–24

Permeability transition pore caspase activation during apoptosis and, 279–80

Peroxisomes
degradation
vacuolar import of proteins and organelles from cytoplasm, 18–26, 28
kinesin motor utilization and, 147

PEST degradation signal
visual transduction in *Drosophila* spp. and, 240–41

pex genes
vacuolar import of proteins and organelles from cytoplasm, 24, 27

Pexophagy
vacuolar import of proteins and organelles from cytoplasm, 19–25

PKI gene
vacuolar import of proteins and organelles from cytoplasm, 25

PGK1 gene
HIF-1 and O₂ homeostasis, 564

PGM1 gene
switching to flowering and, 541

pH

ADF/cofilin family proteins and, 185, 188, 194, 197–98, 200–1, 218

Phase transition
cell polarity in yeast and, 380
switching to flowering and, 519, 522–25

Phagocytosis
ADF/cofilin family proteins and, 185, 212, 219

Phalloidin
ADF/cofilin family proteins and, 185, 193

PH domains
ADF/cofilin family proteins and, 205

Phenylalanine
ADF/cofilin family proteins and, 193

Phenyl-methyl-sulfonyl fluoride (PMSF)
vacuolar import of proteins

and organelles from cytoplasm, 22

Pho4 transcription factor regulation of nuclear localization and, 299–302, 322

PHOS gene regulation of nuclear localization and, 301–2

Phosphatases ADF/cofilin family proteins and, 206–7

Phosphate-binding proteins ADF/cofilin family proteins and, 185

Phosphatidylinositol ADF/cofilin family proteins and, 185, 192, 202, 205, 219

Phosphatidylinositol-4,5-biphosphate visual transduction in *Drosophila* spp. and, 232, 239, 247

Phospholipase C (PLC) visual transduction in *Drosophila* spp. and, 232, 238–39, 246–48, 256

Phospholipids translocons and endoplasmic reticulum membrane, 829–30

Phosphorylation actin-microtubule cooperation and, 74 ADF/cofilin family proteins and, 185, 189–91, 202–9, 211, 219 blue-light photoreceptors in higher plants and, 33, 44–45, 49, 51 lymphocyte cell death and, 122–23 regulation of nuclear localization and, 292–329 SCF and Ring-H2/Cullin-based

ubiquitin ligases, 443, 451, 454 synaptic vesicle biogenesis and, 783–84 visual transduction in *Drosophila* spp. and, 244

Photoperiod promotion pathway switching to flowering and, 526, 529, 534–36, 540, 542

Photoreceptors blue-light higher plants and, 33–53 kinesin motor utilization and, 157

Phototransduction *Drosophila* spp. and, 231–59

Phototropin blue-light photoreceptors in higher plants and, 33, 44–49

Phototropism pathway blue-light photoreceptors in higher plants and, 33, 37, 45, 50–51

PHR1 gene blue-light photoreceptors in higher plants and, 36

phy genes blue-light photoreceptors in higher plants and, 43, 48–51 switching to flowering and, 528, 534–35

Phytochrome switching to flowering and, 524

Pichia pastoris vacuolar import of proteins and organelles from cytoplasm, 19–23, 25–26

PI gene switching to flowering and, 537

Pigment transport

actin-microtubule cooperation and, 63, 65–69, 75–76 neural crest formation and, 81

PKI protein kinase inhibitor regulation of nuclear localization and, 317

Plants ADF/cofilin family proteins and, 199, 203–4, 215–16 blue-light photoreceptors in higher plants and, 33–53

Plasma membrane kinesin motor utilization and, 156 regulation of nuclear localization and, 322 synaptic vesicle biogenesis and, 733–84

Pleiotropy neural induction and, 425

PNM2 gene [PSI+] factor and, 687–91

Podocytes kinesin motor utilization and, 149, 160

Point mutations ADF/cofilin family proteins and, 194, 196–97, 199–200

Pointed ends ADF/cofilin family proteins and, 198

Point mutations ADF/cofilin family proteins and, 198

Polarity cell yeast and, 365–85 structural kinesin motor utilization and, 143–44, 148–49

Polarized transport actin-microtubule cooperation and, 65, 68, 72–73

Polymerization

kinesin motor utilization and, 147, 167

Polymorphisms
viral interference and MHC class I, 583–84

Polyploidy
kinesin motor utilization and, 159

Pore-loop
visual transduction in *Drosophila* spp. and, 240–41

Postnatal life
HIF-1 and O₂ homeostasis, 551–71

Posttranscriptional regulation
lymphocyte cell death and, 113

Posttranslational modification
ADF/cofilin family proteins and, 189
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 448–51
translocons and endoplasmic reticulum membrane, 811–12

Potato
switching to flowering and, 544

Primitive streak
neural induction and, 421
vertebrate endoderm development and, 394–96

Primordia
switching to flowering and, 524–25

Prion hypothesis
yeast [PSI+] and, 661–96

Pro caspase-9
caspase activation during apoptosis and, 269, 277, 279

Profilin
actin-related proteins and, 351, 354–55

ADF/cofilin family proteins and, 196

Proline
ADF/cofilin family proteins and, 189, 202, 205
cell polarity in yeast and, 381
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 447
visual transduction in *Drosophila* spp. and, 240–41

Prolonged depolarization afterpotential (PDA)
visual transduction in *Drosophila* spp. and, 235–36

Prometaphase
ADF/cofilin family proteins and, 211

Promoters
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 456
switching to flowering and, 529–42

β-Propellor domain
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 454

Prophase
ADF/cofilin family proteins and, 211
kinesin motor utilization and, 158

26S Proteasome
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 435, 450

Proteinase B
vacuolar import of proteins and organelles from cytoplasm, 5

Protein conformation-based inheritance

[PSI+] factor and, 661–96

Protein degradation
SCF and
Ring-H2/Cullin-based ubiquitin ligases, 435–61
vacuolar import of proteins and organelles from cytoplasm, 1, 18–28

Protein integration
translocons and endoplasmic reticulum membrane, 799–832

Protein kinase A (PKA)
regulation of nuclear localization and, 316–17
signaling network for *Dictyostelium* spp. and, 469, 489–91, 495–97, 499

Protein kinase C (PKC)
lymphocyte cell death and, 122
visual transduction in *Drosophila* spp. and, 232, 237, 240–41, 252, 257

Proteins
actin-related proteins, 341–58
ADF/cofilin family proteins, 185–219
blue-light photoreceptors in higher plants and, 36–37, 41
kinesin motor utilization and, 156–58
microtubule- and actin-based proteins, 63–76
vacuolar import from cytoplasm and, 1–28

Protein sorting
adaptors for clathrin-mediated traffic and, 705–24

Protein stability domains
HIF-1 and O₂ homeostasis, 559–60

Pseudotetraploidy

ADF/cofilin family proteins and, 211

[*PSI*+] factor epigenetic modulation of translation termination and agents effective in eliminating [*PSI*+], 672–74 biochemical support for [*PSI*+] as yeast prion, 680–83 biological role, 694–95 cytoplasmic transmission, 670–71 discovery of [*PSI*+], 664–70 fungal prions, 695 future research, 695–96 gene product, 674 Hsp104, 678–80, 686 introduction, 662–63 in vitro [*psl*^{-/-}] dominant over [*PSI*+], 669–70 in vitro seeding, 684 mechanistic questions, 685–87 molecular chaperones, 678–80 non-Mendelian regulation of [*PSI*+] induction, 692–93 nonsense suppression, 663–64 nucleic acid mutagens, 671–72 phenotype, 682–83 [*PSI*+] determinant, 670–74 [*PSI*+] no-more-mutations in N region of Sup35p, 687–91 [*PSI*+] variants, 693–94 self-assembly, 683–87 SUP35p, 674–78, 683–92

SUP45p, 691–92 translational ambiguity, 667–70

Pterins blue-light photoreceptors in higher plants and, 37, 52

Promycin translocons and endoplasmic reticulum membrane, 820

Q

Quantitative trait loci switching to flowering and, 525, 528

R

Rabbits ADF/cofilin family proteins and, 195

Rabkinesin-6 kinesin motor utilization and, 154, 165, 169

RanGTPase system nuclear transport and, 607, 611–17

Rapamycin vacuolar import of proteins and organelles from cytoplasm, 18

Rapeseed ADF/cofilin family proteins and, 188

rax1 gene cell polarity in yeast and, 375

rbcS gene blue-light photoreceptors in higher plants and, 39

rdg genes visual transduction in *Drosophila* spp. and, 232, 237, 244–47, 251

Receptors actin-microtubule cooperation and, 72

blue-light photoreceptors in higher plants, 33–53 caspase activation during apoptosis and, 269, 271, 274–77

kinesin motor utilization and, 157, 170 lymphocyte cell death and, 114–15, 126–27 neural induction and, 411, 422–23, 425–26 nuclear transport and, 607, 613–15, 618–19, 623–27, 636–37 regulation of nuclear localization and, 299–322

SCF and Ring-H2/Cullin-based ubiquitin ligases, 450–51 signaling network for *Dictyostelium* spp. and, 469, 471 translocons and endoplasmic reticulum membrane, 803, 807–10, 812–13, 828–29 tumor necrosis factor lymphocyte cell death and, 113, 116–20 visual transduction in *Drosophila* spp. and, 245, 247

Recycling pathways synaptic vesicle biogenesis and, 733, 747–51

Redundancy kinesin motor utilization and, 141, 163–65 regulation of nuclear localization and, 298

Reed/Sternberg cells lymphocyte cell death and, 126

Regulation adaptors for clathrin-mediated traffic and, 718–20

ADF/cofilin family
proteins and, 185–219
caspase activation during
apoptosis and, 269–84
cell polarity in yeast and,
374–77
HIF-1 and O₂ homeostasis,
560–64
kinesin motor utilization
and, 150, 170
neural induction and,
424–25
nuclear localization and,
291–329
nuclear transport and,
611–12
[PSI⁺] factor and, 692–93
signaling network for
Dictyostelium spp. and,
469–505
switching to flowering and,
519, 525–37
vertebrate endoderm
development and, 395–96
visual transduction in
Drosophila spp. and,
251–52

Reproductive phase change
switching to flowering and,
519, 522–23

Respiratory tract
vertebrate endoderm
development and, 393,
403–4

Response regulators
signaling network for
Dictyostelium spp. and,
469–505

Retina
visual transduction in
Drosophila spp. and,
233–35, 240, 248, 250,
252–54

Retrotranslocation
translocons and
endoplasmic reticulum
membrane, 823–24

Rga genes
cell polarity in yeast and,
378

Rhabdomeres
visual transduction in
Drosophila spp. and,
233–35, 247, 252–55

Rhodopsins
visual transduction in
Drosophila spp. and, 232,
236–43, 251, 257

Rho family
neural crest formation and,
101

Rho GTPases
cell polarity in yeast and,
380

Rhombomeres
neural crest formation and,
89–90

Ribonucleoproteins (RNPs)
cell polarity in yeast and,
367

kinesin motor utilization
and, 147

regulation of nuclear
localization and, 313,
328

Ribosomal RNA (rRNA)
[PSI⁺] factor and, 671

Ribosomes
nuclear transport and, 607,
642

translocons and
endoplasmic reticulum
membrane, 799–832

Rice
switching to flowering and,
544

RING finger motifs
cell polarity in yeast and,
377

vacuolar import of proteins
and organelles from
cytoplasm, 17

Ring-H2/Cullin-based
ubiquitin ligase

SCF ubiquitin ligase and,
435–61

Rings
septin
cell polarity in yeast and,
370

RNA-binding domains
switching to flowering and,
530

RNA export
nuclear transport and,
607–43

RNP motifs
switching to flowering and,
530

ROS signaling intermediate
lymphocyte cell death and,
125

Rub1 protein
SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 449–50

Ruffling
membrane
ADF/cofilin family
proteins and, 204–5,
208–9, 219

Rye
ADF/cofilin family
proteins and, 188, 199

S

Saccharomyces cerevisiae
actin-microtubule
cooperation and, 72–74
actin-related proteins and,
343–45, 347, 349, 351,
356–57

ADF/cofilin family
proteins and, 210, 218
kinesin motor utilization
and, 154, 161–64, 166

[PSI⁺] factor
epigenetic modulation of
translation termination
efficiency and, 661–96

SCF and

Ring-H2/Cullin-based ubiquitin ligases, 436, 440–42, 452–53
 vacuolar import of proteins and organelles from cytoplasm, 4, 24–26

sal genes [*PSI+*] factor and, 670

Scaffold proteins adaptors for clathrin-mediated traffic and, 705–24
 visual transduction in *Drosophila* spp. and, 231

Scar1 protein actin-related proteins and, 353–54

SCF ubiquitin ligase Ring-H2/Cullin-based ubiquitin ligase and, 435–61

Schizosaccharomyces pombe actin-related proteins and, 342, 344–45, 355–56

ADF/cofilin family proteins and, 188 [*PSI+*] factor and, 666–67

SCF and Ring-H2/Cullin-based ubiquitin ligases, 440–41, 448, 452–53

Sea urchin actin-microtubule cooperation and, 71

Sec61 protein translocons and endoplasmic reticulum membrane, 799, 802, 805–7, 810–12, 818–19, 824, 828–30

Secretory proteins adaptors for clathrin-mediated traffic and, 705–24 cell polarity and, 382–84 kinesin motor utilization and, 153

translocons and endoplasmic reticulum membrane, 799–832 viral interference and MHC class I, 591–94

Seeding in vitro [*PSI+*] factor and, 684

Segregation neural crest formation and, 98–99

Septin cell polarity in yeast and, 370

Sequestration vacuolar import of proteins and organelles from cytoplasm, 1, 19–25

Serine ADF/cofilin family proteins and, 185, 189–90 regulation of nuclear localization and, 307, 311

SCF and Ring-H2/Cullin-based ubiquitin ligases, 454 switching to flowering and, 530

translocons and endoplasmic reticulum membrane, 821

Serpentine receptors signaling network for *Dictyostelium* spp. and, 469

seven-up gene visual transduction in *Drosophila* spp. and, 242

SEX1 gene switching to flowering and, 541

SH2 domains ADF/cofilin family proteins and, 205 regulation of nuclear localization and, 301

SH3 domains

ADF/cofilin family proteins and, 205, 219

SH3p4 protein synaptic vesicle biogenesis and, 733, 781–83

Sheep HIF-1 and O₂ homeostasis, 567

β-Sheets ADF/cofilin family proteins and, 190–91, 197

shh gene vertebrate endoderm development and, 400–1, 404

shibire gene synaptic vesicle biogenesis and, 749–50, 776–77

Shoot apical meristem switching to flowering and, 520–26, 531

Short days switching to flowering and, 524, 526, 535–36, 540–41

Shuttling regulation of nuclear localization and, 297–98, 308, 322, 329 visual transduction in *Drosophila* spp. and, 245

Signal-mediated transport nuclear transport and, 610–11

Signal peptidase translocons and endoplasmic reticulum membrane, 803, 805, 807, 828–29

Signal recognition particle (SRP) receptor translocons and endoplasmic reticulum membrane, 803, 807–10, 812–13, 828–29, 832

Signal transduction ADF/cofilin family proteins and, 202–7, 209

blue-light photoreceptors
in higher plants and,
37–39, 48, 52–53
cell polarity in yeast and,
376
Dictyostelium spp.
differentiation and,
469–505
HIF-1 and O₂ homeostasis,
562–63
kinesin motor utilization
and, 147, 150, 162
lymphocyte cell death and,
113, 115, 119–25
neural crest formation and,
84, 91–93
neural induction and, 411,
413, 415, 427
regulation of nuclear
localization and, 298, 311
SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 451, 459
switching to flowering and,
524
vertebrate endoderm
development and, 393,
395, 399–401
visual transduction in
Drosophila spp. and,
231–59

Signalplex
visual transduction in
Drosophila spp. and,
231–32, 254–58

Silencer of death domains
(SODD) protein
caspase activation during
apoptosis and, 276

Sinapis alba
blue-light photoreceptors
in higher plants and, 41

Skeletal muscle
ADF/cofilin family
proteins and, 187

Skp1 protein
SCF and

Ring-H2/Cullin-based
ubiquitin ligases, 435,
444–45, 449

Sliding
microtubule
kinesin motor utilization
and, 147–48, 150,
158–60

Slug gene
neural crest formation and,
82, 88, 90, 94–95, 98

Smad-1 gene
neural crest formation and,
97

Smad proteins
neural induction and, 404,
413, 417, 423, 426

Smooth endoplasmic
reticulum
actin-microtubule
cooperation and, 72
visual transduction in
Drosophila spp. and, 247

Smooth muscle
neural crest formation and,
81

SMYI gene
actin-microtubule
cooperation and, 63,
73–75
kinesin motor utilization
and, 162

Snail gene
neural crest formation and,
82, 94–95, 98

SNARE proteins
vacuolar import of proteins
and organelles from
cytoplasm, 17

SOCS boxes
SCF and
Ring-H2/Cullin-based
ubiquitin ligases, 446,
457, 459–60

sog gene
neural induction and, 419,
424

Soluble proteins
kinesin motor utilization
and, 156–58

Soluble transport machinery
regulation of nuclear
localization and, 326–27

Sorting signals
adaptors for
clathrin-mediated traffic
and, 711–18
synaptic vesicle biogenesis
and, 761–68

Sox factor
neural induction and, 417,
426

Spatial factors
switching to flowering and,
543

Spatial patterning
signaling network for
Dictyostelium spp. and,
469–505

Spectrin
ADF/cofilin family
proteins and, 200

speedy gene
switching to flowering and,
528

Spinach
blue-light photoreceptors
in higher plants and, 46
switching to flowering and,
544

Spindles
kinesin motor utilization
and, 143–44, 148–49,
152, 158–60, 164, 169

SPL3 gene
switching to flowering and,
539

Splotch gene
neural crest formation and,
96

Spore cells
signaling network for
Dictyostelium spp. and,
469–505

Spore differentiation factors development and, 404–5
 signaling network for Stomatal opening
Dictyostelium spp. and, blue-light photoreceptors
 500–2 in higher plants and, 33,
 49–50

spy gene Store-operated Ca^{2+} entry
 switching to flowering and, (SOCE)
 534

SSR protein visual transduction in
 translocons and *Drosophila* spp. and,
 endoplasmic reticulum 247
 membrane, 828

Stabilization Structure-function
 visual transduction in relationships
Drosophila spp. and, HIF-1 and O_2 homeostasis,
 243–44 556–60

Stalk *SUF* genes
 actin-microtubule [PSI+] factor and, 668–69
 cooperation and, 66
 kinesin motor utilization Sugarcane
 and, 146, 169 switching to flowering and,
 544

signaling network for SUMO-1 protein
Dictyostelium spp. and, SCF and
 469–505 Ring-H2/Cullin-based
 ubiquitin ligases, 450

Starvation Sup35p protein
 ADF/cofilin family [PSI+] factor and, 661,
 proteins and, 205 674–78, 683–92

regulation of nuclear SUP45p protein
 localization and, 313 [PSI+] factor and, 691–92

vacuolar import of proteins Superfamilies
 and organelles from actin-related proteins and,
 cytoplasm, 3–4, 6–8, 10, 341–58
 12–13, 16–17, 19, 27 kinesin
 conserved motor domain STAT transcription factors
 and, 141–71 regulation of nuclear
 localization and, 311, 329

signaling network for motor
Dictyostelium spp. and, actin-microtubule
 469, 503–5 cooperation and, 63–76

ste20 gene TNF receptor
 cell polarity in yeast and, lymphocyte cell death
 379 and, 113, 116–20

STE sequences *SUP* gene
 translocons and [PSI+] factor and, 668–70
 endoplasmic reticulum switching to flowering and,
 membrane, 817 529, 537

Stomach Supramolecular signaling
 vertebrate endoderm complex
 visual transduction in

Drosophila spp. and, 231–32, 254

SUQ5 gene [PSI+] factor and, 664–67

Survival lymphocyte
 cell death and, 113–28

Swi5 transcription factor regulation of nuclear
 localization and, 305–6

swirl gene neural induction and, 423

Synaptic vesicles actin-microtubule
 cooperation and, 71–72

biogenesis actin, 779–80
 actin-binding proteins, 779–80
 adaptors, 770–75
 amphiphysin, 778–79
 AP2 adaptor complex, 771–73
 AP3 adaptor complex, 774–75
 AP180 adaptor complex, 774
 cell-free systems, 768–70
 classes of neurosecretory vesicles, 734–35
 clathrin, 770–75
 compartments, 736–52
 cytosolic machinery, 768–84
 definitions, 736
 dephosphorylation, 783–84
 donor membranes, 739–51
 dynamin, 775–78
 dynamin-interacting proteins, 775–78
 early endosomes, 739–40
 endocytosis, 761–62
 EPS15, 774

epsin, 774
GTP-binding proteins, 775–79
hetero-oligomeric complexes, 757–58
homo-oligomeric complexes, 757
immature neurons, 751–52
introduction, 734–36
lipid composition, 759–61
lipid-modifying enzymes, 780–83
liposomes, 770
mature neurons, 744–47
molecular dissection of protein machinery, 770
neuroendocrine cells, 768–69
neurotransmitter transporter sorting, 766–68
PC12 cells, 768–69
phosphorylation, 783–84
plasma membrane, 740–42
protein composition, 753–56
protein-lipid interactions, 760–61
protein-protein interactions, 756–59
recycling pathways, 747–51
SH3p4, 781–83
sorting and assembly of synaptic vesicle membrane constituents, 752–68
sorting signals, 761–68
synaptic-like microvesicles, 733, 735–52
synaptic vesicle formation at synapse, 747–51

synaptic vesicle targeting signals vs exclusion signals, 762–65
synaptobrevin-synaptophysin pump, 758–59
synaptjanin, 780–81
synaptosomes, 769
trafficking, 736–52
transport of newly synthesized synaptic vesicle membrane proteins to synapse, 744–47
uniform composition, 753–54
variable composition, 754–56
precursors
kinesin motor utilization and, 147, 149, 151–52, 154, 169

Synaptobrevin-synaptophysin pump
synaptic vesicle biogenesis and, 758–59

Synaptjanin
ADF/cofilin family
proteins and, 202–3, 206
synaptic vesicle biogenesis and, 780–81

Synaptosomes
synaptic vesicle biogenesis and, 769

T

TAP protein
viral interference and MHC class I, 588–91

Targeting signals
synaptic vesicle biogenesis and, 762–65

T cells
ADF/cofilin family
proteins and, 205–6, 213
lymphocyte cell death and, 114–15, 117–19, 124, 127
viral interference and MHC class I, 580–601

Telophase
kinesin motor utilization and, 159

Temperature
switching to flowering and, 525

Temporal factors
switching to flowering and, 543
viral interference and MHC class I, 599–600

Terminal differentiation
signaling network for *Dictyostelium* spp. and, 469, 494–505

Termination
[PSI+] factor and, 661–96
visual transduction in *Drosophila* spp. and, 251–52

Tethers
cytoplasmic
regulation of nuclear localization and, 322
regulated
kinesin motor utilization and, 150, 163

SCF and
Ring-H2/Cullin-based ubiquitin ligases, 446

Tetrahymena thermophila
regulation of nuclear localization and, 327

Tetramerization
kinesin motor utilization and, 150

tfl genes
switching to flowering and, 524, 528, 531, 536–37, 539–40

Thermomyces spp.
kinesin motor utilization and, 166

Threonine

regulation of nuclear localization and, 309

translocons and endoplasmic reticulum membrane, 821

Timeless protein
regulation of nuclear localization and, 314–16, 329

Tobacco
blue-light photoreceptors in higher plants and, 41

***TOC1* gene**
switching to flowering and, 535

***tolloid* gene**
neural induction and, 424

Toxoplasma gondii
ADF/cofilin family proteins and, 188–89, 209

***Tradescantia* spp.**
ADF/cofilin family proteins and, 215–16

Trafficking
adaptors for clathrin-mediated traffic and, 705–24

synaptic vesicle biogenesis and, 733, 736–52

viral interference and MHC class I, 579–601

TRAM protein
translocons and endoplasmic reticulum membrane, 802–30

Transactivation
HIF-1 and O₂ homeostasis, 554–56, 558–59

Transcriptional regulation
lymphocyte cell death and, 113

signaling network for *Dicytostelium* spp. and, 502–3

Transcription factors
HIF-1 and O₂ homeostasis, 551–71

neural crest formation and, 81, 86, 94–95, 101

neural induction and, 416

regulation of nuclear localization and, 292–329

SCF and
Ring-H2/Cullin-based ubiquitin ligases, 459

signaling network for *Dicytostelium* spp. and, 469–70, 477–505

switching to flowering and, 538

vertebrate endoderm development and, 399, 401–4

Transducin
visual transduction in *Drosophila* spp. and, 238–39

Transduction
visual
Drosophila spp. and, 231–59

Transfer DNA (tDNA)
tagging
switching to flowering and, 524, 537

Transfer RNA (tRNA)
nuclear transport and, 607, 630–33

[PSI+] factor and, 663–68

regulation of nuclear localization and, 298, 320–21

translocons and endoplasmic reticulum membrane, 809, 820, 827

Transforming growth factor β (TGF- β)
neural induction and, 412–13, 420, 423, 426

vertebrate endoderm development and, 395, 404–5

Transgenes
lymphocyte cell death and, 127

switching to flowering and, 534

visual transduction in *Drosophila* spp. and, 252

***trans*-Golgi network**
adaptors for clathrin-mediated traffic and, 705–24

Transient receptor potential (TRP)
visual transduction in *Drosophila* spp. and, 235–38, 248–51, 254–58

Transient receptor
potential-like (TRPL)
visual transduction in *Drosophila* spp. and, 237–38, 248–51, 254, 257–58

Translational regulation
neural induction and, 425

Translocation
kinesin motor utilization and, 141

nuclear transport and, 621–22

regulation of nuclear localization and, 293–98

termination efficiency epigenetic modulation and, 661–96

Translocons
endoplasmic reticulum membrane and aqueous pore, 808–11, 830–31
assembly, 811–12
composition of translocon, 801–3
conversion of translocon operational mode from translocation to integration, 826
coordination between translocon and

ribosome, 826–27
cotranslational integration, 816
cotranslational translocation, 814–16
functional modes, 812–16
future research, 831–32
introduction, 800–1
lateral movement and insertion of transmembrane sequence, 818–21
nascent chain accessibility to cytoplasm and ER lumen, 825–26
nascent chain processing and folding, 821–23
nascent secretory proteins other than apoB exposed to cytosol, 831
orientation of transmembrane sequences before their insertion into bilayer, 830
permeability barrier, 810, 821–24
phospholipids, 829–30
posttranslational modification, 811–12
protein stoichiometry and arrangement, 805–8
regulation and dynamics of translocon structure and function, 824–27
retrotranslocation, 823–24
signal sequence destination after leaving SRP, 828–29
structure of translocon, 801–11
targeting, 812–14
translocon-associated proteins, 803–5, 829–30

translocon conversion from functional to nonfunctional, 825
transmembrane sequence, 816–18, 829–30
turnover, 811–12
unresolved issues, 827–31

Transmembrane domains visual transduction in *Drosophila* spp. and, 240–41

Transmembrane sequence translocons and endoplasmic reticulum membrane, 816–21

Transplantation viral interference and MHC class I, 579

Transport actin-microtubule cooperation and, 63–76 between cell nucleus and cytoplasm, 607–43 HIF-1 and O₂ homeostasis, 551, 555 vacuolar import of proteins and organelles from cytoplasm, 1

Treadmilling cell polarity in yeast and, 383

Tropomyosins ADF/cofilin family proteins and, 185–86, 200, 214, 219

Tryptophan blue-light photoreceptors in higher plants and, 41

Tubulins neural crest formation and, 97

Tumor necrosis factor (TNF) receptor superfamily lymphocyte cell death and, 113, 116–20

Tumor progression HIF-1 and O₂ homeostasis, 551–71

Twinstar ADF/cofilin family proteins and, 188, 204, 211

Tyrosine ADF/cofilin family proteins and, 193, 205–6 regulation of nuclear localization and, 309

U

U937 cells ADF/cofilin family proteins and, 212

Ubiquitin ligases SCF and Ring-H2/Cullin-based architecture of SCF complexes and SCF pathway components, 439–45 Cdc4, 447–48 Cdc34, 451, 455–56 Cdc53, 445 Cdc53/cullin, 449–50 diversification of SCF function, 445–59 F boxes, 446–48, 450–51, 457–59 Hrt1 protein, 446, 450 identification of SCF ubiquitin ligase activity, 437–39 introduction, 436 mechanism of action of SCF, 454–56 multiubiquitin chain promotion, 456 perspectives, 459–61 posttranslational control of SCF pathway components, 448–51 Skp1 protein, 444–45, 449

SOCS boxes, 457, 459
 substrates of SCF pathway, 451–56
 subunits of SCF, 439
 γ Cdc34, 448

ufo genes
 switching to flowering and, 537–38

unc genes
 ADF/cofilin family proteins and, 188, 198, 210
 kinesin motor utilization and, 151, 169

V

Vacuolar import of proteins and organelles from cytoplasm
 aminopeptidase I, 8–13
APG genes, 13–17
apg gene screening by starvation, 7–8
 Apg pathway, 4–18
AUT genes, 13–17
 autophagy, 4–18
 biochemistry, 6–8, 10–13
Candida bodinii, 23–24
 conversion between pathways, 17–18
CVT genes, 13–17
CVT pathway, 8–18
 fructose-1,6-biphosphatase, 26–27
 future research, 27–28
 genetic screening, 7–8, 25–26
 glucose-induced selective autophagy genes, 25–26
Hansenula polymorpha, 23–25
 introduction, 2–3
 kinetics, 10

macroautophagy, 3–8
 macropexophagy, 23–24
 morphological analysis, 4–6, 10–13, 19–25
 non-methylotrophic yeast, 24–25
 peroxisomal degradation, 18–26
 peroxisomal degradation-deficient genes, 25
 peroxisomal sequestration, 19–25
 pexophagy, 19–25
Pichia pastoris, 19–23, 25–26
 regulation of pathways, 17–18
Saccharomyces cerevisiae, 24–25
 vesicle-mediated pathway for API import, 10–13

Vascular development
 HIF-1 and O_2 homeostasis, 551–71

Vascular endothelial growth factor (VEGF)
 HIF-1 and O_2 homeostasis, 551, 555, 564–69

Vegetative phase change
 switching to flowering and, 519, 522–23

Vent genes
 neural induction and, 414, 417

Vernalization promotion pathway
 switching to flowering and, 532–33

Vertebrates
 ADF/cofilin family proteins and, 185–219
 endoderm development and, 393–405
 kinesin motor utilization and, 149

lymphocyte cell death and, 113–14
 neural crest formation and, 81–104
 neural induction and, 411–27
 viral interference and MHC class I, 579–601
 visual transduction in *Drosophila* spp. and, 231

Vesicle transport
 adaptors for clathrin-mediated traffic and, 705–24
 kinesin motor utilization and, 169
 vacuolar import of proteins and organelles from cytoplasm, 10–13

VHL tumor suppressor protein
 SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 457, 459–60

Vid pathway
 vacuolar import of proteins and organelles from cytoplasm, 28

Villin
 ADF/cofilin family proteins and, 192–93

Vimentin
 kinesin motor utilization and, 148, 158, 169

Viral interference
 MHC class I and absence of strategies, 600–1
 antigen processing, 580–601
 avoiding T_{CD8}^+ surveillance, 583–601
 binding to cell surface class I molecules, 599
 blocking peptide generation, 587–88

blocking TAP-mediated peptide transport into endoplasmic reticulum, 588–91
class I-peptide complex generation, 580–83
determinant-specific blockade, 583–84
diverting class I molecules to lysosomes, 597
future research, 601
Herpesviridae, 588–91
immune surveillance, 580
immunodominance, 583
internalization of cell surface class I molecules, 597–99
introduction, 580
MHC polymorphism, 583–84
multigenic effects, 599–600
retaining class I molecules in secretory pathway, 591–94
shipping class I molecules to cytosol, 594–97
 T_{CD8+} , 580–601
temporal control, 599–600
vertebrates, 580

Viral proteins
caspase activation during apoptosis and, 269
regulation of nuclear localization and, 326

Visual transduction
Drosophila spp. and Ca^{2+} /calmodulin-dependent adaptation and termination of photoresponse, 251–52
 Ca^{2+} -dependent negative feedback regulation, 251–54
compound eye structure, 233–35
downstream effectors, 245–46
genetics, 233–37
 G_q , 245–46
heteromultimeric channels, 249–50
inositol phospholipid signaling system, 246
introduction, 232
light-dependent cation influx, 246–50
metarhodopsin stabilization and deactivation, 243–45
NINAC as major retinal target for Ca^{2+} /calmodulin, 253–54
perspectives, 258–59
phospholipase C activation, 246–48
phototransduction, 237–39, 246, 254–56
rhodopsins, 239, 241–43
signalplex, 254–58
 TRP , 248–50
 $TRPL$, 248–50

VP16 gene
switching to flowering and, 538

VPS genes
vacuolar import of proteins and organelles from cytoplasm, 10, 18

vrn genes
switching to flowering and, 532–33

W

WASP-related protein
cell polarity in yeast and, 379–80, 382

WD-40 domains

SCF and Ring-H2/Cullin-based ubiquitin ligases, 447, 454

Western blot analysis
vacuolar import of proteins and organelles from cytoplasm, 15

Wheat
ADF/cofilin family proteins and, 188, 199
switching to flowering and, 544

Williams syndrome
ADF/cofilin family proteins and, 217

WLC gene
switching to flowering and, 528

Wnt growth factors
neural crest formation and, 81, 86, 89–93, 95, 104
neural induction and, 427

Wortmannin
ADF/cofilin family proteins and, 207
vacuolar import of proteins and organelles from cytoplasm, 23

X

XBF-1 transcription factor
neural induction and, 416

Xenopus laevis
actin-microtubule cooperation and, 68–69, 71, 75
actin-related proteins and, 355
ADF/cofilin family proteins and, 188, 201, 205, 207–8, 211–12, 214–16
kinesin motor utilization and, 151–52, 154, 159, 161
neural crest formation and, 81–98

neural induction and, 411, 416–17, 419, 421–25, 427
 $[PSI^+]$ factor and, 666–67
 regulation of nuclear localization and, 307, 310, 320, 323
SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 439, 442, 453
 visual transduction in *Drosophila* spp. and, 250

XFD receptor
 neural induction and, 426

Xng1 factor
 neural induction and, 417

Xnr3 factor
 neural induction and, 415, 417

Xolloid metalloprotease
 neural induction and, 424

X-ray crystallography
 ADF/cofilin family proteins and, 192

Y

yAP1 transcription factor
 regulation of nuclear localization and, 321–22

yCdc34
 SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 448

Yeast
 actin-microtubule cooperation and, 63, 65, 72–74
 actin-related proteins and, 342–45, 347, 349–51, 355–57
 ADF/cofilin family proteins and, 192–94, 201, 210, 218–19
 blue-light photoreceptors in higher plants and, 51
 cell polarity and, 365–85
 kinesin motor utilization and, 154, 161–64, 166
 $[PSI^+]$ factor
 epigenetic modulation of translation termination efficiency and, 661–96
 regulation of nuclear localization and, 305, 309, 320–21, 327
SCF and
 Ring-H2/Cullin-based ubiquitin ligases, 436, 440–42, 448–49, 451–53, 457
 vacuolar import of proteins and organelles from cytoplasm, 4–5, 24–25

Ypp6 motif
 adaptors for clathrin-mediated traffic and, 712–16

ypt genes
 vacuolar import of proteins and organelles from cytoplasm, 10

Z

Zea mays
 ADF/cofilin family proteins and, 188, 198
 blue-light photoreceptors in higher plants and, 45

Zebrafish
 neural crest formation and, 82, 91, 94, 103
 neural induction and, 423–24, 427

ZEN-4 protein
 kinesin motor utilization and, 159

Zic genes
 neural crest formation and, 91, 96–97

Zinc blot analysis
 blue-light photoreceptors in higher plants and, 49

Zinc finger motifs
 neural crest formation and, 96
 neural induction and, 416

Zippering
 microtubule kinesin motor utilization and, 147, 150, 160–62

